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ABSTRACT

The Missouri Industrial and Educational Graphic Arts (MIEGA) survey was done to determine the current status and trends of the graphic arts industry and graphic arts education in Missouri for use as the basis for the later development of secondary school graphic arts state curriculum guides. Data were collected through two status surveys in addition to an extensive review of related research and statistical data. The first survey studied the graphic arts offerings in the public secondary schools of Missouri while the second one studied the commercial graphic arts industries in Missouri. The conclusions included the following: (1) although the graphic arts offerings in Missouri's secondary schools continue to expand in the number of schools offering graphic arts, the number of courses offered, and the breadth of content, a vast majority of students receive no graphic arts instruction; (2) the graphic arts offerings generally lack a coordinated approach; (3) in many schools the graphic arts instructional content does not reflect the contemporary graphic arts industry; and (4) the vocational-technical graphic arts programs are not serving their purpose very well in the eyes of industry. (This report includes ninety-two data tables and ten implications of the findings. Two graphic communications curriculum models, several letters sent during the study, and the survey forms are appended.) (EM)

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FINAL REPORT
MISSOURI INDUSTRIAL AND EDUCATIONAL GRAPHIC ARTS SURVEY
PROJECT NO. 1239

Charles E. Keseman
Central Missouri State University
Warrensburg, Missouri

September 30, 1976

funded by
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Chapter 1

INTRODUCTION

Introductory Statement

Throughout history one of the purposes of public education was to provide the opportunity for an educated person to learn about the society in which he lives. As early as 1917 one of the most influential educators of that day, Charles A. Bennett, pointed out that if man is to retain enough mastery of his environment to make it serve his needs, every person must know about the materials, principles, and products of industry. Bennett reasoned that the schools should include those categories of work which were fundamental to civilization. After studying the industry of his day, Bennett concluded that the curriculum in manual arts should be comprised of the graphic arts, the mechanic arts, the plastic arts, the textile arts, and the bookmaking arts.[1] The importance of the graphic arts has not diminished during the half century following Bennett's observations.

More recent statistics show that the graphic arts industry ranked among the largest in the United States in nearly every statistical category by which such size comparisons are made.[2] Further observations suggest that few industries have such an influence upon the everyday life of every citizen as does the graphic arts.

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[1] Charles A. Bennett, The Manual Arts (Peoria: The Manual Arts Press, 1917), pp. 15-16.

[2] Thornton Moore, ed., Statistical Abstract of the United States, 1974, Ninety-Fifth Edition (Washington, D. C.: United States Government Printing Office, 1974), p. 727.

Could one imagine a day in our society without some use of the graphic arts? Even though the past influence has been tremendous, the growth and effect of the graphic arts industry continues to increase. This growth was revealed in a recent nationwide study of the graphic arts industry completed under the sponsorship of the Eastman Kodak Company.[3]

The shortage of qualified personnel in all phases of the graphic arts industry--production, sales, management-- was cited in the Kodak study as the number one problem of the graphic arts industry.[4] The study confirmed that the schools and in-plant training were failing to meet even the present, much less the future, manpower needs. Helping to provide for the manpower needs, however, may be only the "visible tip of the iceberg." Educators agree that before an individual commits himself to a specialized occupational education program, he should first have identified an interest and an aptitude for such an occupational field. This would imply that many young people should be afforded the opportunity to explore the graphic arts as they assess whether special interests and aptitudes exist in this, as well as many other, occupational areas. These educational needs related to exploring would then form the "hidden bulk of the iceberg."

In recognition of these needs in society industrial education programs have been provided in the schools of our nation for nearly one hundred years to help all citizens to comprehend the effect of the various industries upon their lives, to help every citizen examine the opportunities within various industries for jobs compatible with the individual's potential, and to provide entry-level educational experiences needed for selected occupations. In addition, in some instances the public schools are requested to provide in-service education to meet the needs of the citizens of that community who wish to retain their occupational positions, attain new skills for their positions, retrain for new occupations, or advance on their jobs. The Kodak survey revealed that the second greatest problem in employment within the graphic arts industry was poor trade knowledge and skills;[5] hence, a great need remained for continuing education and training activity, both for production and management. This need was again expressed in the Kodak finding that inadequate ability was also the largest single problem in the retention of graphic arts positions.[6]

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[3] Kodak Graphic Arts Industry Manpower Study: Complete Report (Rochester, N. Y.: Eastman Kodak Co., 1973), pp. 16-25.

[4] Ibid., p. 26.

Among specific recommendations for education drawn from the Manpower Study were (1) that more people be prepared for production and managerial opportunities in graphic arts, and (2) that education programs place increased emphasis on developing students' interest in graphic arts and in exploring the technology underlying the graphic arts, such as that provided in industrial arts.[7] Therefore, it is imperative that the public secondary schools help students identify interests and talents related to graphic arts and prepare for job opportunities related to these interests and abilities. The unanswered question then was "What should students in the public schools learn about the graphic arts industries?

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[5] _Ibid._, p. 28.

[6] _Ibid._, p. 30.

[7] _Ibid._, p. 36.

The State Department of Elementary and Secondary Education in Missouri agreed with the national trend to include graphic arts as a part of the recommended industrial arts curriculum. In the Handbook for Industrial Arts Education, the publication describing industrial arts education in Missouri, graphic arts was shown as one of the areas recommended for the industrial arts offering in the secondary schools.[8] However, at the time of this study few schools in Missouri offered graphic arts instruction as a part of the industrial education curriculum and no curriculum guide or similar publication contained a statement of recommended content for graphic arts in Missouri. Furthermore, no study had been made regarding what was being taught in those graphic arts classes which were being offered.

One of the recommendations of the 1968-70 study by the Missouri State Department of Education entitled Industrial Arts Education in Missouri was that "in order to improve the scope of industrial arts, the curriculum should be expanded to include more programs such as: graphic arts, electricity and electronics, power mechanics, industrial ceramics, and other new technological areas as suggested in Missouri's Handbook for Industrial Arts Education."[9] Another recommendation was that "continued attention should focus upon the articulation of industrial arts and vocational industrial education."[10]

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[8] Missouri State Department of Education, Handbook for Industrial Arts Education, (Jefferson City: Missouri State Department of Education, 1969), 2-2.

[9] Missouri State Department of Education, Industrial Arts Education in Missouri (Jefferson City: Missouri State Department of Education, 1970), p. 38.

[10] Ibid.

When a new content area is added to the secondary school, instructors and administrators turn to knowledgeable individuals and to published curriculum guides and other professional publications for assistance. Throughout its existence industrial education in the United States has claimed to base its curricular content on American industry. Hence, it was reasoned, industrial personnel should be consulted and industrial activities and needs should be examined to provide guidance in deriving content for industrial education.

Perhaps the initial seed for the planning of the present study came from the recommendation in the 1968-70 Missouri study that "large-scale curriculum studies should be initiated for each of the curriculum areas of the industrial occupation programs with the intent of bringing the course to the level of current practice."[11]

In Missouri during the few years preceding this study several curriculum guides were prepared for industrial arts education in the traditional content areas of woods, metals, drafting, and electricity/electronics. These curriculum guides were developed by educators within the state and, although the content was not identified through a formal analysis of industry, these guides did include many current industrial trends within the specific industrial area. Furthermore, the available curriculum guides were developed essentially for the purposes of industrial arts education and content related to the vocational-technical purposes of instruction was not identified concurrently.

It was thought that, in addition to the current practices and soundest recommendations of graphic arts educators, a more formal study of industrial trends and practices in the graphic arts industry should be made. It was further thought that concurrent identification of both industrial arts and vocational-technical content would lead to maximum articulation and should be completed based upon the findings of this study.

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[11] Ibid., p. 39.

Statement of the Problem

Graphic arts has been recognized as an important segment of American industry and is recommended as one of the principal areas of instruction in the industrial education offerings of the secondary schools of Missouri. However, at the time of this study no articulated curriculum guides in graphic arts were available at the state level to provide guidance for developing graphic arts courses in secondary schools from the middle school through the vocational-technical school.

Purpose of the Study

The purpose of this study was to ascertain the current status and trends of the graphic arts industry and graphic arts education in Missouri as a basis for later development of a formal body of content related to graphic arts for the various levels of occupationally oriented industrial arts and vocational industrial-technical education in the secondary schools of Missouri.

More specifically answers were sought to the following questions:

1. What are the graphic arts course offerings in the public secondary schools of Missouri?
2. How many students are enrolled at the various grade levels in graphic arts courses?
3. What course content is being included in the graphic arts courses?

4. What educational and work experience do graphic arts teachers have?

5. What responsibilities do and should graphic arts teachers have for production activities in their laboratories?

6. What are the nature, size, and trends of the graphic arts industries in Missouri?

7. What are the sources, desired educational attainment levels, and problem areas of employees in the graphic arts industries?

8. To what extent are various operations performed in the graphic arts industries?

9. What type of equipment is being used in the graphic arts industries?

10. What knowledges, skills, personal characteristics, and experiences are desired of vocational-technical school graphic arts graduates by employers?

11. What changes in the present secondary school course offerings could be recommended to better reflect the existing status of the graphic arts industries of Missouri?

Assumptions of the Study

The following assumptions were made for this investigation:

1. That the graphic arts should be included in a complete industrial education program in the secondary schools of Missouri.

2. That a body of curriculum content related to graphic arts and desirable for inclusion in the public secondary schools of Missouri can be identified through an analysis of the graphic arts industry in Missouri along with the best practices, thought, and research findings of graphic arts educators.

3. That articulation of the total graphic arts offerings in industrial education from the middle school through the vocational-technical school is desirable.

4. That industrial education teachers must be educated in up-to-date technology if they are to lead students to an understanding of their industrial environment and must be prepared to modify instructional programs to keep them up to date.

5. That respondents were representative of the larger population which they represented.

6. That all respondents understood the item or request for data and answered honestly.

7. That panels of jurors or critics used in the study were qualified and capable of serving in the capacity requested.

8. That the data gathering techniques employed were appropriate for the study.

9. That the measures used in the study provided valid and reliable data.

Limitations of the Study

The following limitations for this study are presented:

1. The findings and conclusions are limited to the schools or the industrial firms in the state of Missouri.

2. The findings related to the graphic arts education survey are limited to the extent that all graphic arts educational programs were identified and that responding schools are typical of all similar schools in Missouri.

3. The findings related to the graphic arts industrial survey are limited to the extent that all, and only, industrial firms with graphic arts activities were identified and that responding firms are typical of all similar firms in Missouri.

4. The findings of all surveys used in the study are limited to the extent that the content of all information forms was complete and clearly stated so that respondents could respond accurately and completely.

5. The findings and conclusions of the study are limited to the extent that all responses were interpreted correctly, coded accurately, and processed properly by the research staff.

Definitions of Terms

Commercial graphic arts firm is an industrial establishment, separate in organizational structure and/or location, which as its primary function accomplishes activities related to the mass reproduction of printed images as listed in the Standard Industrial Classification 2700 series or a closely related series in the Missouri Directory of

Manufacturing and Mining, 1973. The term "commercial print shop" is used synonomously.

Comprehensive junior-senior high school is a secondary school in Missouri that typically includes both general education courses and specialized fields of study in a single administrative unit and that typically enrolls students from grade 7 through grade 12. For this study, this group also includes those separate administrative units only enrolling students in grades 9 through 12 or grades 10 through 12 in districts where junior and senior high schools were divided administratively or where certain occupational programs were offered in separate vocational-technical schools.

Graphic arts education is that portion of industrial education which deals with mass reproduction of visible images on various substrates and typically includes printing, photography, bookbinding, and related studies.

Graphic arts firm is an industrial establishment in Missouri, separate in organizational structure and/or location, which accomplishes, either as a primary function (commercial) or as a secondary, supportive function (in-plant), the mass reproduction of printed images.

Industrial education is that structured body of knowledge pertaining to tools, materials, products, and processes of that economic institution known as industry. In the secondary schools this includes both "vocational-industrial education" which has occupational preparation as its primary purpose and "industrial arts education" which emphasizes the study of this body of knowledge for purposes other than direct preparation for jobs.

In-plant graphic arts firm is an industrial establishment in Missouri, separate in organizational structure and/or location, which as its primary function accomplishes activities other than the mass reproduction of printed images, but which accomplishes these types of activities as a secondary function in support of its primary function. The terms "captive shop" and "in-plant print shop" are used synonomously.

Junior high school is a separate administrative unit of a school system in Missouri which usually enrolls students in grades 7, 8, and/or 9. In this study districts which had no separate junior high school administrative unit were included as comprehensive junior-senior high schools.

Vocational-technical high school is a separate administrative unit of a school system in Missouri or several area high school systems which offers preparation in skilled or semi-skilled occupations, usually enrolling students in grades 11 and 12. In this study districts with no separate vocational-technical administrative unit were included as comprehensive junior-senior high schools.

Sources of Data and Method of Study

This study, entitled the Missouri Industrial and Educational Graphic Arts (MIEGA) Survey, includes two status surveys in addition to a rather extensive review of related research and statistical data.

The MIEGA Survey studied the graphic arts offerings in the public secondary schools of Missouri in the spring of 1975. This survey consisted of developing a short initial survey form mailed to all public secondary schools in Missouri and a longer comprehensive survey form mailed to those schools indicating on the short form that graphic arts was offered as a part of the industrial education program in their school. Follow-up letters and duplicate forms were mailed or telephone calls were made to non-respondents in order to attain the highest possible response to both survey forms. Responses to the survey forms were then tabulated, analyzed by computer, and reported in tabular and narrative form.

The second MIEGA Survey studied the graphic arts industries in Missouri. The commercial graphic arts industries were selected principally from the listings in the _Missouri Directory of Manufacturing and Management, 1973_ and the in-plant graphic arts industries were identified by consulting distributors of graphic arts supplies, paper suppliers, and graphic arts professional groups. A comprehensive survey instrument was developed and mailed to all industrial firms identified within the state as having graphic arts activities. A follow-up letter and a duplicate form were mailed to non-responding firms. Responses to these forms were likewise tabulated, analyzed by computer, and reported in tabular and narrative form.

Since the primary purpose of this investigation was to provide resource material for future curriculum guides, considerable effort was made to survey and report pertinent related literature. Recent statistical data and current technical publications were surveyed for the current status of selected aspects of the graphic arts industries. Research studies related to graphic arts education and the graphic arts industries were analyzed for pertinent findings. Curriculum guides and curriculum models related to graphic arts were identified and analyzed.

Upon completion of the final report, copies were mailed to interested supervisors, teachers, schools, and industries. Additional copies are available from Mr. B. Eugene Brightwell, Supervisor of Industrial Arts, State Department of Elementary and Secondary Education, Jefferson City, MO.

Chapter 2

RELATED RESEARCH AND LITERATURE

This chapter provides an overview of the nature and status of the graphic arts industry as gleaned from a variety of government statistical reports and similar publications. Significant trends related to graphic arts are also examined.

Research findings related to conceptual curriculum models in graphic arts are reviewed. Additional studies relating the graphic arts industries to the secondary school graphic arts programs, to teacher education programs, and to post-secondary graphic arts technology and management programs are also described. These findings provide important additional resource materials for planning a graphic arts curriculum for the secondary schools of Missouri.

Overview of the Graphic Arts Industries

The printing and publishing industry is one of the major United States industries, annually employing approximately six percent of all employees in manufacturing, producing approximately four percent of the total value of shipments in manufacturing, and including about thirteen percent of all manufacturing establishments.[12] The diversity of the printing industry is exemplified in the fact that almost every county in the nation has a newspaper and/or commercial printing business. This section of the report describes a definition of the graphic arts industry, evaluates the status of printing and publishing in the nation's economy, and identifies some of the significant trends related to printing and publishing.

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[12] Moore, op. cit., pp. 725-727.

Definition of the Graphic Arts Industry

The graphic arts industry has traditionally been defined as the US Government Standard Industrial Code Classification section 27 (SIC-27: Printing and Publishing). The outline of the SIC-27 Classification is as follows:

2711	Newspapers
2721	Periodicals
2731	Book publishing
2732	Book printing
2741	Miscellaneous printing
2751	Commercial printing, letterpress and screen
2752	Commercial printing, lithographic
2753	Engraving and plate printing (except photoengraving)
2754	Commercial printing, gravure
2761	Manifold business forms
2771	Greeting card publishing
2782	Blankbooks and looseleaf binders
2789	Bookbinding and related work
2791	Typesetting
2793	Photoengraving services
2794	Elecrotyping and stereotyping services
2795	Lithographic platemaking services

In addition to the structured printing and publishing industry, many graphic arts functions are performed within industries listed under classifications other than SIC-27. Although the number of in-plant or captive printing activities is difficult to identify or classify, distributors who provide graphic arts supplies to these departments consistently indicate that the number and significance of these operations is great.

The editor of Graphic Arts Monthly reports that the estimate of the number of in-plant installations in the United States may vary from

40,000 to 70,000 depending on the scope of the definition used to define them. Nearly 12,000 firms were identified which used an offset press 17 x 22" or larger and/or four or more duplicating machines.[13] Another source states that "there are over 40,000 in-plant shops in the United States, with 1,000 more opening each year."[14] From these estimates it appears that the number of in-plant operations may exceed the number of commercial establishments.

When this researcher attempted to identify the in-plant departments in Missouri, he found suppliers reluctant to identify their clients. Therefore, the extent of graphic arts activities within captive plants outside the formal structure of printing and publishing in Missouri can only be estimated and declared as "significant."

Additional graphic arts activities are accomplished under other SIC classifications, such as SIC-3993: Signs and Advertising Displays, SIC-3555: Printing Trades Machinery and Equipment, SIC-3861: Photographic Equipment and Supplies, and SIC-2893: Printing Ink as well as some of the SIC-26: Paper and Allied Products series.

Until a clearer delineation of the entire graphic arts industry becomes available, it appears that an examination of the SIC-27 series is the best indicator of graphic arts activities in the United States.

Status of Printing and Publishing in the United States

"The printing and publishing industries continue to mirror the Nation's economic and demographic trends. Demand for printed products is stimulated by a combination of population growth, rising school enrollment, higher income levels and expanded business activity. The graphic industries will always be characterized by steady growth, stable employment, high wages and a large number of small establishments. . . . An average annual rate of growth between 5.4 to 6.2 percent is expected through the 1970's."[15]

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[13] Bert Chapman, "From the Editor's Notebook," Graphic Arts Monthly, XLVIII (May, 1976), 30.

[14] Edward J. Kane, "Industry Lends An Educational Hand," Reproductions Review and Methods, XXVI (February, 1976), 10-14.

A number of factors are used when describing or comparing industries or segments of industry. Among the most descriptive factors are the number of employees, the number of establishments, the value of shipments, the value added in manufacturing, the amount of capital expenditure, and the employee earnings. These factors will be considered as they relate to SIC-27: Printing and Publishing.

Number of Employees. The latest available data (June 1975) indicates that there are nearly 1.1 million people employed in printing in the U.S.--about six percent of all persons employed in manufacturing.[16] For a number of years, newspaper printing and commercial printing have each employed approximately one-third of the total number of employees in the industry. These two segments rather consistently dominate the overall printing and publishing industry. The 1974 employment in newspaper printing was 386,100 persons and in commercial printing was 346,000 persons. The annual increase in both areas is approximately one percent.[17]

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[15] Department of Commerce, U.S. Industrial Outlook, 1974 (Washington: Government Printing Office, 1974), p. 265.

[16] Bureau of Labor Statistics, Employment and Earnings, August, 1975, Bulletin LAB-441, Volume XXII, No. 2, (Washington: Government Printing Office, 1975), p. 54.

[17] Department of Commerce, U.S. Industrial Outlook, 1975 (Washington: Government Printing Office, 1975), pp. 290-295.

While the printing industry will have a small overall increase, it appears that lithographic commercial printing will grow somewhat faster.[18] The printing industry has a higher proportion of non-production workers than that of manfacturing overall--forty percent for printing and thirty percent for manufacturing overall.[19]

The ratio of production workers to overall employees varies among segments of the graphic arts industries from about sixteen to eighty percent. In periodicals printing, the percentage of employees for production work is about sixteen percent. Several other segments, including newspaper printing, are about one-half production employees. Commercial printing, manifold business forms, blankbooks and bookbinding, and printing trades services include about eight percent production workers.[20]

In Missouri in 1967 ninety-four percent of all printing employees were located in the metropolitan areas of St. Louis, Kansas City, Springfield, and St. Joseph. Only two thousand printing workers were located outside of these areas, 1400 of these being production workers. This indicated that the 216 out-state firms are likely to have employed a total of less than three non-production workers and less than seven production workers. In the four metropolitan areas of Missouri the mean number of workers is approximately seventeen non-production workers per firm and about twenty production workers per firm.[21] This tends to indicate that needs for printing workers in Missouri are primarily in the four large cities.

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[18] Bureau of Labor Statistics, Outlook for Technology and Manpower in Printing and Publishing, Bulletin 1774 (Washington: Government Printing Office, 1973), p. 4.

[19] Moore, loc. cit. and Manpower Report of the President: April, 1975 (Washington: Government Printing Office,1975), p. 286.

[20] Moore, op. cit., pp. 726-727.

The percentage of women in printing and publishing is considerably higher than manufacturing overall, but less than the overall national workforce. Overall, in 1975 women comprised thirty-nine percent of the total labor force, twenty-eight percent of those employed in manufacturing, and thirty-five percent of the printing and publishing workers. Within the printing industries, commercial printing had the lowest ratio of women at twenty-nine percent, while periodical and book printing employed fifty-one and fifty-two percent women respectively to have the highest proportion of women.[22]

The labor turnover rates in the printing industries are lower than in the overall manufacturing industries. The accession rates in June, 1975, in printing was 3.1 percent per month compared with a total manufacturing accession rate of 4.5 percent. The monthly separation rate was 2.8 percent for printing compared with 3.7 percent for all of manufacturing.[23] The overall accession and separation rate in manufacturing in Missouri were 4.2 percent and 4.1 percent per month respectively.[24]

Table 1 identifies some graphic arts related occupations and the employment trends of those occupations. It shows that lithographic

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[21] Bureau of Census, Census of Manufacturers, 1967. Area Series: Missouri, Publication No. MC 67 (3)-26 (Washington: Government Printing Office, 1970), pp. (26-8)-(26-11).

[22] Bureau of Labor Statistics, Employment and Earnings, op. cit., pp. 58-62.

[23] Ibid., pp. 114-117.

[24] Ibid., p. 120.

Table 1

SELECTED GRAPHIC ARTS OCCUPATIONS: ANNUAL EMPLOYMENT IN THOUSANDS, 1972, AND ESTIMATED GROWTH 1972-85*

Occupational Title	Estimated Employment 1972	Estimated Mean Annual Growth 1972-85	Estimated Mean Annual Opening (Growth Plus Replacement) 1972-85	Estimated Percent Rate of Growth 1972-85
Printing and Publishing				
Bookbinders and Related Works	32	0.5	0.6	17.3
Composing Room Occupations	170	-0.3	4.3	-2.3
Electrotypers and Stereotypers	7	-0.1	0.1	-14.8
Lithographic Occupations	81	3.0	5.1	48.4
Photoengravers	16	-0.1	0.2	-9.2
Pressmen	142	3.2	6.1	28.6
Subtotal		6.2	16.4	
Related				
Commercial Artists	60		3.4	26.7
Photographers	77		2.8	14.3
Photographic Lab. Occupations	38		2.7	
Foremen	1400		58.0	
Newspaper Reporters	39		2.6	15-30
Manufacturers Salesworkers	423		20.0	15-30

*Bureau of Labor Statistics, Occupational Manpower and Training Needs, Bulletin 1824 (Washington: Government Printing Office, 1974) pp. 29-30, 74-75 and Office of Manpower Studies, Employment Opportunity Projections: Occupational Outlook to 1985, Manpower Report 74-1 (West Lafayette: Purdue University, 1974), pp. 62-68.

occupations and pressmen have the highest estimated annual growth rate from 1972 through 1985.

Apprenticeship training under the union supervision is the most common method of preparing production workers in the printing industry. The printing and publishing occupations listed in Table 2 are those for which apprenticeships usually provide the necessary training. From the latest available data, ten to fifteen thousand apprentices in the printing trades are registered annually with less than three thousand completing their apprenticeship annually.[25] Table 2 shows the status of apprenticeship in the printing trades from 1970 to 1972.

Since sixty percent of the 1.1 million total employment in printing and publishing are production workers and since the growth rate of the entire industry is one percent, a growth of 6600 production employees annually would be expected. This is somewhat consistent with the 6200 printing and publishing workers reported as needed in selected occupations and shown as annual growth in Table 1. The available statistics in Table 2 indicate that the registered apprentices will not fill half of these expected openings in the production phases of printing and publishing.

Number of Establishments. The total number of establishments in the printing and packaging industry in 1975 was not found; however, it is estimated that the number has remained constant at around 42,000, about thirteen percent of all of the nation's manufacturing firms. This estimate is based upon the fact that the 1975 figures[26] of 8022 establishments

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[25] Bureau of Labor Statistics, Outlook for Technology, op. cit., p.27 and Manpower Report, op. cit., p. 331.

[26] Department of Commerce, Industrial Outlook, 1975, loc. cit.

in newspaper printing and 22,000 establishments in commercial printing are identical with those for 1972.[27] These two segments make up about three-fourths of all printing establishments. The commercial printing segment of the industry has claimed over half of all printing establishments for a number of years while the newspaper firms total approximately twenty percent of the establishments.[28]

Table 2

TRAINING STATUS OF REGISTERED APPRENTICES IN THE PRINTING TRADES: 1970-72*

Year	In Training Beginning Of Year	New Registrants or Reinstatements	Completions	Cancellations	In Training End Of Year
1970	13706	5991	2900	1867	14930
1971	10997[a]	3092	1724	1104	11261
1972	13392[a]	3428	2706	2238	11876

[a] Numbers differ from number in training at end of previous year because of revisions in reporting.

*Manpower Report of the President: April, 1975 (Washington: Government Printing Office, 1975), p. 331.

While the 1972 average number of employees per establishment was sixty for all manufacturing firms, the average for the printing and publishing field was twenty-five persons. The commercial printing firms, while large in numbers, were especially small in size with an average of fifteen workers per establishment. Newspaper firms averaged just over forty-three workers while the giants of the printing industries were the 195 greeting card publishers which averaged one hundred eighteen workers.[29] Hence, it is evident that the printing industry is dominated by a large number of small shops.

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[27] Moore, loc. cit.

[28] Ibid.

In Missouri the statistics for 1967 indicate that over ninety percent of the printing establishments were located in the metropolitan areas of St. Louis, Kansas City, Springfield, and St. Joseph. The metropolitan shops also had more employees than the rural firms. The establishments outside of these metropolitan areas had a mean of just under ten workers while the overall state mean was almost thirty workers per printing firm.[30]

Printing Production is Rising. As was mentioned earlier, the printing industry includes approximately four percent of the value of all manufacturing shipments--about $39 billion in 1975.[31] Over thirty percent of this amount was in the commercial printing segment. Newspaper publishing comprised almost another thirty percent, book publishing and printing added almost twelve percent, and periodicals added about eleven percent.[32] Two sources estimated that production of the overall printing industry would grow comparable to the gross national product, or about

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[29] Ibid.

[30] Bureau of Census, Area Series: Missouri, loc. cit.

[31] Moore, loc. cit.

[32] Department of Commerce, Industrial Outlook, 1975, op. cit., p. 287.

five percent per year,[33] while another estimated this growth would reach 6.8 percent per year.[34] Regardless of which estimate is used, some segments of the industry have grown at a faster rate since 1967 and were expected to continue this rate of growth at least until 1980. Manifold business forms (10.3 percent), commercial printing (8.2 percent), book publishing (7.5 percent), and some printing trade services promised the greatest percent of production increases.[35]

The value added by manufacturing provides some guide to the efficiency of the industry. The overall manufacturing average of value added per employee in 1972 was approximately $18,500; however, in the printing industry this amount was over $19,000. The largest segments of the printing industry--newspaper and commercial printing--each had total value added by manufacturing equal to about thirty percent of the total industry; however, their average value added per employee were only $18,000 and $16,500 respectively. The two most efficient segments of printing were periodical publishing industry which added an average value of almost $32,000 per employee and book publishing which adds $26,000 per worker through manufacturing.[36] Neither the statistics for years later than 1972 nor the predictions to 1980 for this factor were available.

Published industrial production indexes indicate that printing

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[33] Pocket Pal, Eleventh edition (New York: International Paper Co., 1974), pp. 22-26 and Bert D. Chapman, "Look At the Forecasts of '76", Graphic Arts Monthly, XLVIII (June, 1976), 40-46.

[34] Department of Commerce, Industrial Outlook, 1975, loc. cit.

[35] Ibid. and Charles R. Cook, "Economic Upsurge Foretells Bright Outlook," Printing and Publishing, Volume 14, No. 1 (Washington: Department of Commerce, 1973), p. 4.

[36] Moore, op. cit., p. 725.

and publishing compare favorably with all of industry and with the manufacturing segment. Table 3 makes this comparison as it shows the comparable index ratings from 1960 through 1972, with 1967 considered as 100 percent.

Table 3

SELECTED INDUSTRIAL PRODUCTION INDEXES, 1960 TO 1972*

Category (1967=100)	1960	1965	1968	1969	1970	1971	1972
Overall Industrial Production	66	89	106	111	107	107	114
All of Manufacturing	65	89	106	111	105	105	113
Printing and Publishing	69	91	104	109	108	108	115

*Bureau of Census, Pocket Data Book, U.S.A., 1973 (Washington: Government Printing Office, 1973) p. 249.

The stock holder is always interested in the rate of return on his investment and evaluates the success of an industry on this factor. Table 4 shows that for more than ten years prior to this report, the printing and publishing industry consistently provided a profit rate from one to two percent above the manufacturing average.

Pay Rates Are Strong. In July of 1975 the production or nonsupervisory employees in the private sector of the economy earned on average of $4.51 per hour and production employees in the manufacturing industries averaged $4.78 per hour, while the printing and publishing production workers averaged earning $5.38 per hour.[37] This represented an

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[37] Bureau of Labor Statistics, Employment and Earnings, op. cit., pp. 82-90.

Table 4

PERCENT OF PROFIT AFTER TAXES ON STOCKHOLDERS EQUITY IN MANUFACTURING CORPORATIONS*

Category	1960	1965	1970	1971	1972
All of Manufacturing	9.2	13.0	9.3	9.7	10.6
Printing and Publishing	10.6	14.2	11.2	10.7	12.0

*Bureau of Census, _Pocket Data Book, U.S.A., 1973_ (Washington: Government Printing Office, 1973), p. 246.

increase of forty-one cents per hour in the average wage over a one-year period for the printing industry. The comparable increase for the total private sector was twenty-nine cents and for manufacturing was thirty-six cents per hour. When the 36.7 average working hours per week and 1.9 average overtime hours were considered, the average weekly earnings for production employees in the printing industry was $197.45. Comparable earnings for all private industry was $164.62 and for all manufacturing was $187.85. Within the industry, the lithographic commercial printers had the highest average pay per week at $211.12 while the newspaper printers received the highest pay per hour at $5.83. At the other end of the scale, within the industry the blankbook and bookbinding workers were the lowest paid with means of $4.07 per hour and $156.29 per week.[38]

Within the state of Missouri the average pay for all production workers on manufacturing payrolls was $185.81 per week or $4.74 per hour for an average 39.2 hour work week. As might be expected, the average pay rates in Kansas City and St. Louis were higher at $5.30 and $5.45 per hour and $207.76 and $215.82 per week respectively.[39]

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[38] _Ibid._

Capital Spending Rates Are Strong. The rate of annual capital expenditure per employee is one indicator of the pace of technological change. Using 1972 statistics, total capital expenditure for printing totaled over $1 billion and capital expenditures per employee in printing averaged approximately $1000. This was about $200 less per employee than the average for all manufacturing industries. The expenditure rates in the following segments were above that of the overall printing industry: commercial printing, $1100; manifold business forms, $1200; and greeting cards, $2000. The lowest expenditure per employee was in the blankbooks and bookbinding segment with an average of $500 annually.[40] In Missouri in 1967 the mean capital expenditure per employee in printing was about $750.[41]

There is evidence that the gain in capital expenditures per employee in commercial lithographic printing between 1947 and 1963 probably reflects the increased use of phototypesetting equipment and web-offset presses.[42] The wave of new technology has affected the newspaper industry in recent years as capital expenditures went from $411 per employee in 1963 to $1000 in 1972.[43]

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[39] Ibid., p.110.

[40] Moore, op. cit., p. 727.

[41] Bureau of Census, Area Series: Missouri, loc. cit.

[42] Bureau of Labor Statistics, Outlook for Technology, op. cit., p. 5.

[43] Moore, loc. cit.

Significant Trends Related To Graphic Arts

Perhaps the most significant trend in the graphic arts industries is the rate of technological advancement and change. A study of the impact of technology on the graphic arts from 1976 to 1981 was the subject of a study just begun during the present investigation by the Graphic Arts Technical Foundation.[44] Although an in-depth study is not herewith presented, several of the most significant advances in printing technology and their effects will be described. Additional details are presented in a special section of the Kodak study.[45]

Computers and Electronics. It appears that the advancement of printing technology in recent years is closely related to new applications found for the computer. In general the computer extends human capacity in speed, sensing, and accuracy. Some computers used in printing are special-purpose and are often used for a single purpose while others also serve the general needs of the industry. Computers are used in image generation to select and position master character sets, to store and recall copy, and to make decisions regarding justification and hyphenation.[46] They are used in image transfer to control laser beams for solid state printing and to control the nozzle in jet printing.[47] Other specialized uses of computers, increasingly in conjunction with laser beams, are in color correcting and exposing in photographing color separations,[48] in matching inks, and in facsimile transmission of publications over long distances, perhaps even eliminating traditional plates in image transfer in the future.[49]

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[44] "News Notes," Graphic Arts Monthly, XLVII (October, 1975), 28.

[45] Eastman Kodak Company, Complete Report, op. cit., pp. 179-293.

[46] Pocket Pal, op. cit., pp. 56-60.

[47] Ibid., pp. 25-26.

[48] Ibid., pp. 81-82.

Of course the printing industry also has the more traditional uses for general-purpose computers, such as accounting, payrolls, billing, production scheduling, estimating, machine monitoring, production statistics, quality control, and addressing.

Displacement and Retraining of Workers. With the changes to more automated and more sophisticated equipment, jobs in the printing industry are changing. The total number of jobs continues to increase as automation creates nearly as many new jobs as it eliminates and the economy demands more printed products; however, technological advancement generally means a higher skill level is required in the newly created jobs than in the jobs being eliminated.[50] This means that the worker lives in constant fear that his job will soon become obsolete if technological advancement is encouraged. At best for the employees this means having to retrain; at worst it means unemployment. The printing trade unions are active in helping to ease the effect of these changes on its members. Union contracts are showing provisions for helping members adjust to changes brought about by new technology. Training courses and retraining programs related to new technology are offered by several unions. Union contracts often also provide for company training, for reassignment and/or retraining of displaced workers, for specifying that new equipment be operated by the union members covered in the contract, and for distribution of the profits of technological change for the benefit of the workers.[51] These factors also place added emphasis on union concerns related to retirement age and benefits, shorter workweeks, and formal training programs.

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[49] Ibid., pp. 23-24 and David L. DePue, "About Laser Graphics," Man/Society/ Technology, XXXV (May/June, 1976), 232-233.

[50] Chapman, "Look At Forecasts," op. cit., p. 42.

On the other hand, unions also are becoming more concerned in cooperating with management to insure the overall health of the industry in some areas with special problems. In New York and Chicago, traditionally two of the graphic arts centers in the United States, the cost of labor and high taxes combine with urban congestion to encourage printing industries to disperse. In Chicago lithographers have agreed to a contract with no pay raises in order to help keep printing in Chicago and develop long-range job security.[52]

Resource Shortages. All areas of the printing industry have felt the impact of a general shortage of paper and pulp. In 1974 eighty percent of the respondents to a Printing Industries of America survey reported some difficulty in obtaining paper.[53] This shortage has been complicated by the energy availability and cost, strikes and the labor contracts, high capital spending brought about at least in part by pollution abatement regulations, closing of marginal production units, and delay in opening of new paper processing facilities. It is estimated that the worldwide pulp shortage will last throughout the 1970's even though some recent expansion of new capacity is scheduled for completion in 1977 or 1978.[54]

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[51] Robert V. Critchlow, "Technological Changes in the Printing and Publishing Industry," Monthly Labor Review, XCIII (August, 1970), 7-8.

[52] Bert Chapman, "From the Editor's Notebook," Graphic Arts Monthly, XLVIII (June, 1976), 35.

[53] "News Review: Update On Energy and Supplies Shortage," Reproductions Review and Methods, XXIV (June, 1974), 7, 20.

Approximately eight percent of the paper pulp produced in the United States originates in the 250 captive pulp mills, with the remaining output produced by the 58 plants producing for the open market. The non-integrated users of pulp find bidding from other countries to be strong and shortages to be international. Increased use of recycled wastepaper, especially in paperboard grades, appears to be needed in even larger quantities in the future.[55]

New processes in pulp processing have aided in effectiveness and efficiency in the industry.[56] The refiner groundwood process conserves the wood supply, oxygen bleaching reduces air and water pollution, computer-controlled continuous digesters allow the use of sawdust in pulpmaking, and an airborne drying system, the Swedish flakt process, is an advancement in pulp drying. Other processes used in Sweden and Japan are being studied for their feasibility in the United States.[57]

Other materials which have been in short supply in the printing industry are: isopropyl alcohol, wash up solvents, carbon paper, binders board, aluminum, gum arabic, ink, film, vinyl, platemaking chemicals, and photographic chemicals.[58]

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[54] Department of Commerce, Industrial Outlook, 1975, op. cit., pp. 49-52.

[55] Ibid., pp. 57-60.

[56] William H. Bureau, "Today's Concerns and Developments," Graphic Arts Monthly, XLVIII (January, 1976), 65-69.

[57] Department of Commerce, Industrial Outlook, 1975, op. cit., pp. 58-60.

[58] "News Review," loc. cit.

The paper industry must be concerned especially with conservation of energy to produce its products. In the United States the paper industry ranks fourth among industrial consumers of fuel and energy, consuming about ten percent of all purchased fuel and energy used by all manufacturers in 1971. It does produce more than one-third of its own fuel from waste fuels--bark, sawdust, and spent pulping liquors.[59] Redesigning future papermaking and printing facilities for more efficient use of fuel is necessary. Some sources indicate that the greatest resource shortage which will retard future growth in graphic arts is the lack of available capital.[60]

Phototypesetting. It is estimated that by 1980, most small- to medium-sized newspapers will be using phototypesetting, a move compatible with increased use of web-offset presses. Large newspapers will likely use computerized phototypesetting. Book and periodical printers will likewise increase their use of phototypesetting; however, the small commercial job shop will likely find this process too expensive for their requirements. Most of these phototypesetting requirements will likely be met by second-generation electromechanical equipment.[61]

Third generation cathode ray tube (CRT) applications may have only limited use during the decade of the 1970's because of its expense. Its use in the near future in the printing industry is likely to be primarily in editorial and classified operations of large newspapers and in printing periodicals and books.[62] The terminal includes a CRT display panel, a keyboard, and a light pencil or cursor. Copy is typed on the terminal from prepared copy. Editing, makeup and formatting, and corrections can be made on the terminal prior to typesetting. This results in a very high speed system of setting made-up pages of copy. The use of a laser-actuated phototypesetter which will set up to 1000 newspaper lines per minute is the newest update of the phototypesetting.[63]

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[59] Bureau, op. cit., p. 65.

[60] Chapman, "Look At Forecasts," op. cit., p. 46.

[61] Bureau of Labor Statistics, Outlook for Technology, op. cit., pp. 34-36.

Optical character recognition (OCR) equipment will be of great assistance in setting copy already typed by the customer. However, its use is expected to be minimal because of its expense and its limited capabilities. In this system, copy must be typed using a coded format which the system can decode and translate into the original copy.[64]

Some writers feel that typesetting in the future will be done by the customer in a form that can be used directly by typesetting equipment in the print shop. The forms this customer-prepared copy are likely to take are punched tape, magnetic card, magnetic tape, or copy typed with the OCR code. This will place the responsibility for proofing on the customer and perhaps relieve some of the misunderstandings which occur between the printer and customer. The primary function of the compositors at the print shop will then be formatting the instructions to translate the customer's copy into usable configurations for typesetting machines.[65]

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[62] Ibid. and Pocket Pal, op. cit., pp. 54-56.

[63] Paul J. Hartsuch, "The Technology of Photocomposition," Graphic Arts Monthly, XLVII (September, 1975), 52.

[64] Bureau of Labor Statistics, Outlook for Technology, loc. cit.

[65] Carl P. Palmer, "What's the Future of Jobs in Phototypography?," Graphic Arts Monthly, XLVII (June, 1975), 90-93.

Methods of Image Transfer. In 1973 three-fourths of all weekly, semi-weekly, and tri-weekly newspapers were printed by offset and over half of the nation's dailies were also reproduced using the planographic method.[66] The use of the phototypesetter in offset and the ability to get good color illustrations economically have increased the use of offset.

In commercial printing the offset process continued to gain a larger percentage of the work until in 1975 it accounted for fifty-six percent of the commercial printing products. Letterpress printing continued to gain in volume, but lose in proportion to other methods. Letterpress dropped to thirty-one percent of all commercial printing in 1975. Gravure printing continues to steadily gain in its proportion of the commercial printing work--eleven percent in 1975. Screen process continues with two percent of the overall commercial printing work.[67]

A plastic letterpress plate is being developed to combine the use of phototypesetting with the present investment many establishments have in letterpress printing presses. If it becomes successful, it will likely be used by many large newspapers and may allow letterpress to retain its position among major methods of image transfer.[68] Another system developed to retain the usable letterpress equipment inventory while eliminating the need for metal stereotype plates is the Di-Litho system. This method involves the use of a direct impression of a lithographic plate on letterpress equipment and has no offseting of the image to a rubber blanket as in offset lithography. These plates are cheaper than plastic relief plates.[69]

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[66] Department of Commerce, Industrial Outlook, 1975, op. cit., p. 290.

[67] Ibid., pp. 244-5.

[68] Paul J. Hartsuch, "At L. A. Times: Plastic Plates IN, Stereos OUT," Graphic Arts Monthly XLVIII (January, 1976), 42-47 and Bureau of Labor Statistics, Outlook for Technology, loc. cit.

The U. S. Industrial Outlook, 1975[70] joins Packet Pal[71] in predicting that the eighties may be the decade of gravure. The demand for high-quality, multicolor work makes a strong case for gravure. However, the high cost and weight of press-ready cylinders and inability to produce short runs economically may keep it from competing favorably with offset. Laser etching of gravure cylinders is a major innovation presently being studied.[72] During 1975 lithography was predicted to gain slightly in percentage; however, it possibly is near a plateau in growth, especially if gravure reaches its predicted prominence.

Web presses continue to gain in the volume of work produced, especially the narrow-web type. It is estimated that by 1978 nearly eighty-eight percent of all newspapers may be using web-offset presses.[73] If the plastic letterpress plate is not successful, even the large newspapers may turn to offset lithography. Additional improvements in ink-drying equipment, electronic control devices, and more durable plates will likely develop. Sheet-fed offset presses will increase in number and sophistication, but not in size. The future of rotary letterpress units appears to hinge on the development of plastic plates for the web-fed presses. An increase in web-letterpress units is likely only with successful plastic plates. It appears that cylinder letterpress equipment will continue to decline in use.[74]

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[69] Paul J. Hartsuch, "Di-Litho---Reprieve for Letterpress Newspapers?," Graphic Arts Monthly, XLVII (November, 1975), 60-61.

[70] Department of Commerce, Industrial Outlook, 1975, op. cit., p. 295.

[71] Pocket Pal, op. cit. p. 22.

[72] Bureau of Labor Statistics, Outlook for Technology, op. cit., p. 12.

[73] Ibid., p. 36.

Some of the latest developments in image transfer bypasses the traditional concept of transfer of an image from an image-carrier by impact. In "solid state printing" an electro-conductive drum receives a pattern of latent charged images from a laser beam directed by computer impulses. The charged images are developed by toner and transferred to paper. This image on the drum can be erased and changed quickly. The process eliminates the usual printing plate.[75]

The electrostatic printing process electrostatically attracts dry toner through a screen stencil to produce images on odd-shaped objects like apples, nuts, pills and fried eggs. A variation of this process involves "holes in a bar controlled by a computer and charges transferred through selected holes into an ink cloud to cause ink droplets to be attracted to plain paper to form an image." This device is able to print 12,000 lines per minute, about six times the speed of the fastest impact printer.[76] It, too, eliminates the usual printing plate.

In jet printing no pressure is used as "ink is sprayed through a nozzle under pressure, broken into uniform droplets, charged electrically and deflected by a computer or other image generating device." In the A. B. Dick Videojet system a single nozzle oscillates over a sheet much like an electron-beam produces an image on a television screen. This provides up to 1300 characters per second on packaging materials. The Dijet Printer uses a bank of 200 to 300 jets per inch digitally controlled by a computer program that can form droplets at speeds up to 80,000 per second and can image 70,000 lines of type per minute.[77] Jet printing is not expected to make a major impact in the commercial printing field in the immediate future.[78]

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[74] Ibid.

[75] Pocket Pal, op. cit., pp. 25-26.

[76] Ibid.

Although a number of companies have been involved in three-dimensional reproduction in the past, only two firms--Optigraphics-VPI and Vari-Vue International, Inc.-- have survived the production and marketing problems of this specialty field. Three-dimensional products are of two basic types. One is the full-color picture which has the illusion of depth. The other includes "flickers," where the subjects change from one view to another as the product is moved. Both products use a clear plastic lenticular screen over the printing. A series of parallel half cylinders act as lenses, showing one area of printing while blocking other areas at a given angle of viewing. Another viewing angle will show another area of printing and another picture.[79]

Publishing Trends. In magazine publishing facsimile transmission may be an answer to increased postage rates between the printer and customer. In this concept the type is photoset and page layouts composed in the publishers headquarters, then the punched tapes for the type and page layouts are transmitted to the printing locations where the type is photoset and the magazines are printed.[80] Several periodicals with large circulations are presently using this technique.

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[77] Ibid.

[78] Chapman, "Look At Forecasts," loc. cit.

[79] "Three-Dimensional Reproduction" Graphic Arts Monthly, XLVII (June, 1975), 52-54.

Developments in book publishing worthy of special consideration are the increase in paperback books, copyright problems, computer storage of copy, and micro-publishing. In 1967 paperbacks made up forty-nine percent of the billion books sold.[81] The paperback market continues to expand.

"Fair use" of materials with copyrights continues to be an issue between book publishers and users, such as schools and libraries, which insist on freedom to reproduce parts of books they purchase. Perhaps some clearing house for royalties to facilitate payment of copying will resolve the problem.[82]

Another concept in book publishing would allow the author to compose his work on magnetic tape, which would then be transmitted to computer memory. The editor and others who need the copy would retrieve it and make necessary changes. The completed copy would be stored in page formats in the memory of the computer. Book stores would take orders for the book and contact an area satellite printer who would retrieve the page formats from the data bank in sequential order so that a copy of the entire book could be printed in each pass through the press.[83] Perhaps combining this with the jet printing or electrostatic method will make this experimental concept practical. Reduction in inventory would be the greatest asset of this concept.

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[80] Pocket Pal, op. cit., p. 23.

[81] Department of Commerce, Industrial Outlook, 1975, op. cit. p. 291.

[82] Ibid., p. 292.

[83] Pocket Pal, op. cit. p. 24.

Micropublishing is another important process in recent years. Aperture cards, roll film, and 4" x 6" microfiche are popular microforms. Microfiche often contains about 30 sheets of 8½" x 11" paper. However, magnifications up to 200 are sometimes used. The duplicating speed of 650 pages per second, reduction of storage requirements, and postal savings are three advantages of micropublishing.

Developments in Photography. Many recent technological developments have been achieved in the area of photography. A few of those will be discussed in the paragraphs which follow.

One of the recent tools developed for the industrial professional photographer is the use of glass fibers to transmit light. Fiber optics,[84] is based on the concept that light entering the end of a cylinder of optical material within a certain angle will reflect from wall-to-wall and emerge from the other end. Light can be transmitted even though these fibers are bent.

Ordinarily these fibers are arranged in bundles of 20,000 to 30,000 individual fibers. If they are arranged carefully with consistent orientation at both ends a coherent image may be transmitted; however, this precise and expensive assembling is not necessary for simple light transmission.

The most frequent use is in photography in an environment hostile to man or camera. It may also be employed in such specialized uses as photographing the destructive testing of a product, encoding secret documents, enlarging or reducing an image, or measuring the percentage of plant life in an aerial photograph.

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[84] Adele A. Ierubino, "Fiber Optics Photography," Industrial Photography, XIX (November, 1970), 22-23, 52-57.

A vice-president and general manager of DuPont Company's Photo Products Department predicted that the use of silver in photographic reproduction will be drastically reduced by 1981. The cost of silver has already led to the replacement of silver sensitized paper with plain paper and the xerographic method as the standard procedure in photocopying. He indicated that although DuPont has silverless photopolymers, the newer processes are likely to reduce, but not eliminate, the use of silver in photography in the near future.[85]

A special type of "photograph" is used in sending images of the earth from the Earth Resources Technology Satellite (ERTS). An optical scanning system transmits a barrage of data to the receiving station by telemetry where it is then reconstructed into a special type of visible image. Since the ERTS vehicle is in synchronous orbit with the sun, a given point on earth is photographed each 18 days at the same local time of day. Hence, changes in the earth can be assessed and the results applied in such areas as resources planning, conservation, geography, and cartography.[86]

Aerial photographs from airplanes are also used frequently in planning land use, mapping of roads and trails in wilderness areas, observing vegetation, planning highways, studying pollution and detecting insect damage.

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[85] "News Review: Photopolymers to Make Inroads Into Silver Photographic Market," Reproductions Review and Methods, XXIV (August, 1974), 7,14 and "Industry News: Expect Silver Use Reduction By 1981," Plan and Print, XLIX (July, 1976), 23.

[86] Eastman Kodak Co., Kodak Tech. Bits 73-4, Publication P-3 (Rochester: Eastman Kodak, Co., 1973), pp. 1-3.

Metrication. The acceptance of the Systems International Metric (SI) concept in standards by the United States in December, 1975, has caused the graphic arts industries to examine its effect on their activities.

Although metric paper sizes have been in use by many countries, only recently have metric-ingrained European countries considered a change to the metric typographic point as the system of measurement in printing. The basic argument against a change to metric type systems was the cost of converting the hot metal composing equipment. Although it has been shown that such a changeover can be technically and financially made, its acceptance has been limited.

Some evidence of the acceptance of the metric type standard has recently emerged. The British Standards Institute published a standard for metric type sizes and the West German government declared the metric typographic point as the official type form beginning in 1978. All European Common Market countries have agreed to use the metric typographic system in 1978.[87]

Several metric type systems were under study by the International Organization for Standardization (ISO) at the time of this investigation. A system proposed by S. J. Heden of Sweden appears to have some backing. In his system, Heden defines a "d" as one-tenth of a millimeter and uses this measure to specify type size, line spacing, body size, and margin widths. In the Heden system two numbers are used to specify type size. For example, type specified as 45/60 would have a character mainstroke height of 45 "d" units on a body size of 60 "d" units.[88]

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[87] George A. Randall, "Coming: A Metric System for Printing Papers and Type," Industrial Education, LXI (February, 1974), 24-25 and Clive A. Cameron, "Be Prepared: Metric Is Coming," Printing Management, CII (November, 1972), 42-45.

The standard paper sizes set up by ISO are based on a ratio of one to the square root of two. The metric paper system has three basic sheet series sizes. The A series is a halving series with the A0 size of 841 mm x 1 189 mm (1 m^2). The A1 is 594 mm x 841 mm and the A2 through A5 sizes are successively halved. Each size retains the ratio of 1:1.414.

The B series is also in a ratio of 1:1.414 and is based upon the halving principle. The B0 size is 1 000 mm x 1 414 mm. This provides intermediate sizes to the A series and is used primarily for charts and posters.

When sheets larger than the A0 or B0 sizes are needed, a prefix is added to the letter. Hence, a 2A sheet is 1 189 mm x 1 682 mm.

Paper used for postcards, folders, and envelopes is sized in the C series paper sizes. The C envelopes are sized to accommodate A-sized sheets.[89] (See Appendix A for standard sizes of the A, B, and C series.)

"The Technical Association for Paper and Pulp Industry has adopted the metric system of weight per unit area expressed in grams per square metre (g/m^2) and a 500 sheet ream."[90] The metric term expressing substance of paper is "grammage." The standard series is based upon the Renard (R) series of geometric progressions. The R^{20} series uses the 20th root of 10 ($\sqrt[20]{10}$) and the R^{40} series uses the 40th root of

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[88] Randall, loc. cit.

[89] Ibid.

[90] Ibid.

10 ($\sqrt[40]{10}$). The R^{20} series then provides 20 paper weights between 10 and 100 with each weight 12.5 percent heavier than the previous sheet. The R^{40} series provides twice as many intermediary sizes and progresses by an enlargement factor of 1.06.

During the time of this study the Printing/Writing Paper Division of the American Paper Institute recommended that no changes whatsoever be made in the sizes or basis weights of printing and writing papers at this time. It was recommended that the sizes and basis weights of paper be shown on packages of paper in metrics as well as in the customary system.[91] This first step in "soft" conversion to the SI standard will be followed later by "hard" conversion of equipment.

Printing machinery would have to be developed by manufacturers which would use the preferred range of ISO paper sizes to an optimum.

Graphic Arts Conceptual Models

This section of the study will examine several research studies which may serve as guides or conceptual models for the development of curriculum guides in graphic arts in Missouri. The concept of cluster courses is not new in industrial education; however, in recent years both secondary schools and teacher education departments in colleges and universities are reporting increased emphasis in the cluster concept.[92]

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[91] William H. Bureau, "More About the Metric System," Graphic Arts Monthly, XLVII (November, 1975), 74-76.

[92] Howard S. Smith, "From the Nation: What Curriculum Developments Are Being Felt in Industrial Education," Industrial Education, LX (November, 1975), 7, 69-70 and Howard S. Smith "From the Nation: From Individual Schools About Requests For Teachers and Trends," Industrial Education, LX (December, 1973), 4-8.

An expressed goal of the Missouri Advisory Council on Vocational Education is "to promote the cluster concept in vocational programs."[93] Hence, a curriculum model related to a cluster concept in graphic arts was important to the present investigation.

The purpose of a 1967 study by Frantz[94] was to identify the occupational competencies required for a cluster concept program in graphic arts through the application of Smith's system analysis approach.

The needs for the cluster concept as expressed by Frantz were: "(1) There is a need to provide students with a greater degree of mobility on a geographical basis; (2) There was a need to provide students with greater flexibility in occupational choice patterns; (3) There was a need to identify occupational competencies required for job entry into a group of occupations in the graphic arts industry; and (4) There was a need to identify occupational competencies for cluster concept programs in graphic arts that were closely related to the actual practices of the graphic arts industry."[95]

An analysis of the graphic arts industry indicated that the commercial printing industries classified as SIC-2751 and SIC-2752 were suitable for the development of a cluster concept program in vocational education. It was determined that a sampling procedure would be necessary to identify the general occupational skills and knowledges to be included in the cluster.

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[93] Missouri Advisory Council on Vocational Education, Move in '74, Fifth Annual Report (Jefferson City: Missouri Advisory Council on Vocational Education, 1974), 23.

[94] Nevin Richards Frantz, Jr., "The Identification of Occupational Competencies For a Cluster Concept Program in Graphic Arts Through the Application of a System Analysis Approach," (unpublished Doctor's dissertation, University of Maryland, 1967).

[95] Ibid., pp. 2-4.

A listing of occupations related to SIC-2751 and SIC-2752 was identified and a set of criteria was developed for selecting occupations in a graphic arts cluster. The criteria was evaluated and ranked in importance by representatives of labor, government, and management. For each criterion, three statements representing various levels of the criterion were assigned numerical values. Each occupation was assigned an occupational importance score based upon its ability to meet the ranked criteria. Occupations receiving scores in the seventy-fifth percentile were selected for the graphic arts cluster. The following occupations were included in the graphic arts cluster:[96]

Presswork

- Letterpress
  - Platen Pressman
- Lithography
  - Offset Pressman
  - Offset duplicating machine operator

Plate Preparation

- Lithography
  - Cameraman
  - Stripper
  - Platemaker

Binding

- Paper cutting machine operator
- Folding machine operator
- Stiching machine operator

Composition

- Letterpress
  - Linotype operator
  - Hand Compositor
  - Stoneman
- Lithography
  - Paste-up man

The occupational competencies required for job entry into the graphic arts cluster were identified by twenty-eight supervisors in industrial print shops to form a task inventory. Each competency was stated in behavior terms and classified as directly related, indirectly related, and generally related. A final task inventory of 233 occupational competencies[97] for the selected occupations was agreed upon from this task, and a learning sequence was established. A panel of graphic arts educators critiqued the final task inventory and found it suitable for implementing a cluster concept program in graphic arts at the secondary school level.

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[96] _Ibid._, p. 72.

Fecik[98] conducted a study in which the technology of the graphic communications industry was classified into a logical structure. After carefully analyzing industrial processes and techniques, Fecik carefully ordered and classified them under the major elements. An exploratory structure was developed and critiqued by graphic arts industrial representatives and educators. The comments of the evaluators formed the basis for revisions.

In his classification Fecik identified the common elements of graphic reproduction processes as: design, copy generation, image conversion, image carriers, reproduction devices and finishing operations. He classified the reproduction processes as: relief, intaglio, planography, screen process, electrostatic and holography.[99] The structure for graphic communication technology as identified by Fecik may form the basis for graphic communications or graphic arts courses at almost any educational level. The outline shown in Appendix B represents the structure he recommended.

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[97] Ibid., pp. 426-449.

[98] John Thomas Fecik, "The Identificationcation and Classification of Graphic Communication Technology," (unpublished Doctor's dissertation, University of Maryland, 1970).

[99] Ibid., pp. 263-264.

A study by Gysler in 1971 has tremendous implications for the curriculum content related to graphic arts or graphic communication, especially at the beginning levels. The recommendation of the Kodak study that the most beneficial educational program would be "a broad industrial arts type program designed to explore the technology which underlies graphic communications and to determine and develop interest in these areas"[100] may have an answer in the structure recommended by Gysler.

Gysler[101] developed the structure of graphic communications by analysis and synthesis of existing programs of study in graphic communication, communication theory, and the graphic communication industry. An assessment of the proposed model was made by a panel of seven experts who were innovators and writers in graphic communications. The recommended changes were considered and modifications were made.

A proposed curriculum for fitting graphic communications into the existing graphics curriculum of industrial arts education at the college level was developed. Three different combinations of courses were proposed--3 courses, 5 courses, or 8 courses.

The technology of graphic communications was organized around five major concepts: administration, creation, generation, reproduction, and distribution. The diagram shown in Appendix B illustrates the basic model developed. A more complete model outline is provided by Gysler.[102]

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[100] Graphics Markets Division, Manpower for Graphic Communications . . . A Time for Change, Bulletin ED 10-18 (Rochester: Eastman Kodak Co., 1973), p. 6.

[101] Randolph Gysler, "A Rationale and Structure For Graphic Communication Technology With Implications For Industrial Arts Education" (unpublished Doctor's dissertation, The Ohio State University, 1971).

[102] Ibid., pp. 414-433.

Salvagin[103] completed a study of photographic technology in 1974, to determine the relative use and importance of photographic technology in industry as well as drafting or graphic communications offerings in the field of industrial education. He surveyed 145 corporations and 169 secondary and post-secondary industrial education programs in California, Illinois, Massachusetts, Michigan, New Jersey, New York, Ohio, Pennsylvania, and Texas.

The topics which educators ranked highest for inclusion in the school curriculum were basic photography, cut and paste methods, photographic reproduction, and photographic illustration. On the other hand, industrial personnel ranked the following topics highest for inclusion in the curriculum: microfilm methods, drafting standards for microfilm, photodrafting, and basic photography.

Salvagin derived the following conclusions from his study:

1. Instructors in industrial education, drafting, or graphic communications courses should offer instruction in photographic techniques and applications at the secondary and post-secondary levels.
2. Instruction in photographic technology should be provided for future teachers of drafting or graphic communications as well as those presently teaching in the education field.
3. Educators prefer to offer specific course content throughout the educational spectrum while corporate representatives desire many basic educational experiences for students immediately prior to their initial corporate employment.
4. Corporate representatives suggest educational curriculum content based upon economic and efficiency factors. Industrial educators, in comparison, offer course content based upon what they think should be taught, often without suggestions or guidance from the industrial fields about which they are teaching.
5. Due to the relatively recent development and high cost of computer/photograph interaction systems, few corporations and educational institutions have access to such systems.[104]

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[103] Carlton E. Salvagin, "Photographic Technology: Background, Present Status and Educational Implications For Graphic Communications At the Secondary and Post-Secondary Levels" (unpublished Doctor's dissertation, Utah State University, 1974).

[104] *Ibid.*, p. 135.

Research Related to Graphic Arts in the Secondary Schools

A number of research studies related to graphic arts instruction in the secondary schools and the graphic arts industries have been made and will be reported in the following sections.

Studies in Missouri

Since this study involves graphic arts in the secondary schools of Missouri, the several studies reviewed first describe findings in this state involving graphic arts.

During the 1964-65 school year Wallis[105] surveyed the public schools of Missouri. He found that printing was then offered in only four (3.2 percent) and advanced printing in three (2.4 percent) of the responding class AAA public high schools of Missouri. None of the responding class AA, class A or unclassified high schools offered printing instruction. At that time printing was taught in four (4.9 percent) and graphic arts in two (2.4 percent) of the responding class AAA public junior high schools. None of the junior high schools of the other classes of schools offered graphic arts at that time.[106]

Of the 310 responding teachers at the 296 high schools offering the general shop course in 1964-65, only six (1.9 percent) included printing as one of the activities in the course. Of those 103 general shop teachers in the 71 junior high schools included in the study, six

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[105] Donald E. Wallis, "Status of and Direction For Industrial Arts In the Public Schools of Missouri With Implications For Teacher Education" (unpublished Doctor's dissertation, University of Missouri--Columbia, 1965).

[106] *Ibid.*, pp. 25-29.

(5.8 percent) included printing as an activity in general shop and one (1.0 percent) included bookcrafts as a general shop activity.[107] In addition, Wallis found that three (five percent) of the sixty public high schools of Missouri that rotated students through a series of unit shops for introductory purposes included graphic arts as one of the units. These three schools respectively included six, ten, and thirteen weeks of instruction in graphic arts. Of the thirty-two junior high schools reporting the use of rotating unit shops, one (3.1 percent) included printing and bookcrafts, each for nine weeks.[108]

The combined enrollment in printing and graphic arts classes in 1964-65 for all reporting high schools and junior high schools in Missouri was 458 students. Of these, 208 were enrolled in grade eight, 214 in grade nine, 4 in grade ten, and 16 each in grades eleven and twelve.[109]

Wallis identified desirable manipulative and informational instructional content for each of the most frequently taught areas of industrial arts at both the high school and junior high school levels. He used an evaluation by subject matter specialists to identify the content in each area. These specialists rated each unit of instruction on a five-point scale ranging from "0--of no importance" to "4--very important." It is interpreted that instructional units with a composite rating of 6 or higher are "of some importance" and that those with a composite rating of 9 or higher are "important."

For the junior high schools few topics other than those related to letterpress printing received composite ratings of 9 or higher.

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[107] _Ibid_., pp. 33-34.

[108] _Ibid_., pp. 35-39.

[109] _Ibid_., pp. 42-45.

For the high schools most topics related to letterpress and offset printing received composite ratings of 9 or above; however, few topics related to other areas of graphic arts received composite ratings of 9 or above.[110]

In a later study published by the Missouri State Department of Education in 1970, graphic arts was found to be offered by 16, or two percent, of the 674 teachers responding. Some of the tabular data presented in this study and those presented by Wallis appear to be inconsistent. In 1964-65 Wallis reported that 296, or eight-two percent, of the reporting schools offered general shop, while the 1968-70 study reports that 273, or only forty-one percent, of the schools offered general shop at the high school level. Likewise at the junior high school level, Wallis found that 87, or over eighty-one percent, of the reporting schools offered general shop and the 1968-70 study reported that the number of junior high schools offering general shop had increased to 218, but the percentage had dropped drastically to thirty-three.[111] The 1968-70 study did not identify the number of schools including graphic arts in their general shop activities.

In 1964 Andre[112] studied the graduates from vocational-technical programs in St. Louis, Missouri, for the ten year period, 1949-1959. He found that during this period, 83.4 percent of the graduates from printing programs got their first job in a trade related to their preparation.

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[110] Ibid., 127-134, 171-179.

[111] Missouri State Department of Education, Industrial Arts Education in Missouri, op. cit., p. 11.

[112] Nevin E. Andre, "Post-High School Educational Experiences and Occupational Status of General-Academic and Vocational-Technical High School Graduates" (unpublished Doctor's dissertation, University of Missouri--Columbia, 1964).

In 1964, 71.4 percent of those workers were still employed in the same trade. These were the highest percentages of initial placement and retention of any trades included in the study.

Another study related to graphic arts in Missouri was conducted by Rayford[113] in 1967. He studied the employment and training needs for printers in Missouri industries along with the graduates of the eleven vocational schools offering printing in the state. Data for the study were provided by managers of 265 printing industries, 126 vocational printing graduates, and 13 vocational printing instructors who completed information forms along with the administrators in the eleven vocational printing programs who were interviewed and visited.

From 1962 through 1966 the eleven vocational programs graduated 329 students. Seventy-three percent of the graduates were employed initially in printing or related trades. From one to five years after graduation fifty percent of the graduates were employed in these trades. Graduates performed thirty-nine different types of work on their first jobs with the largest number hired as pressmen or compositors.

At the time of the study, three of the eleven vocational programs offered both offset with coldtype and letterpress with hot metal, five concentrated on offset, and three offered only letterpress. The managers, instructors, and graduates all thought the schools should provide broad, basic training. The instructors and graduates had a more positive opinion than the industrial respondents regarding the number of skills, levels of performance, and related information provided by the vocational schools for their graduates. As a result of his investigation Rayford concluded that:

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[113] Erwin W. Rayford, "Employment Opportunities, Training Needs, and Vocational Education For the Graphic Arts in Missouri" (unpublished Doctor's dissertation, University of Missouri--Columbia, 1967).

> 1. Vocational printing programs in Missouri were not training enough students to meet the need for new printing production workers at the time of the study, and it appeared that they would be even less able to do so in the next 8 years.
> 2. The largest number of job openings will occur in the larger printing industries, but vocational printing graduates can expect to be more successful as rated by their employers in the smaller industries.
> 3. The vocational programs as a whole appeared to be adequately meeting the training needs of new workers in the printing trades, but when analyzed individually it appeared that most of the programs included training in too narrow a range of printing processes.
> 4. The schools appeared to be adequately equipped to provide basic training in cold type composition and duplicator operation, but not in offset presswork or on tape or electronically controlled machines.
> 5. Training in the coldtype and offset processes appeared to be increasing in importance, while the hot metal and letterpress processes appeared to be declining in importance.
> 6. Graduates of vocational printing programs in Missouri tend to find jobs in the trades for which they are trained and to remain and succeed in these trades.
> 7. The effects of automation on training and employment in the printing trades were not really known at the time of the study.[114]

Nationwide Studies

An investigation of the printing industry which is especially significant to this study is the nationwide Kodak Manpower Study. The information forms used by Kodak were reviewed and provided a guide for the present study. For their study the Eastman Kodak Company asked five noted graphic arts educators to survey the nation in 1971. The two major objectives of the study were: (1) to determine the current status of industry manpower and (2) to predict manpower needs for the seventies.

In organizing the study the United States was divided into five geographical regions. Questionnaires were developed and mailed to the owners or managers of 5000 companies across the country. The companies were equally divided among those with one to nine employers and those with ten or more employees. The companies were also broken down by major industry classification. The sampling was based on a representative number of companies from each classification rather than on the total number of companies in the region. Of the 5000 companies included in the initial mailing, 1033 responded to the survey.

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[114] Ibid., Abstract, p. 3.

A second questionnaire was prepared and mailed to 150 manufacturers of graphic arts equipment. It yielded a twenty-nine percent return. This questionnaire provided data on equipment produced, according to major industry classification and production process. The trends related to the technical knowledge and the job skill requirements for operating and maintaining the equipment were also provided.

In addition, the "Summary Survey of Graphic Arts Technology,"[115] prepared by the Graphic Arts Research Center of the Rochester Institute of Technology as part of the Kodak study, outlined the status and predictions for the future of graphic arts technology according to production areas and is probably the most comprehensive and pertinent statement available on this subject.

The following recommendations for education were made as a result of the Kodak study:

> 1. Graphic communications should be taught as a family of major technologies which contribute to the overall process of visual communication.
> 2. New people in increased numbers should be prepared for production and managerial opportunities in the graphic communications industry of the 1970's. While all types of printing should be explored, schools should place special emphasis on developing people

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[115] Eastman Kodak Co., Complete Report, loc. cit.

for employment in in-plant and general commercial areas, with equally special emphasis on the offset lithographic process.[116]

More specific recommendations for secondary education were:

1. Graphic arts programs at all levels must shift their emphasis to the areas of layout and design, photo composition, paste-up and copy preparation, camerawork, stripping, offset platemaking, sheet-fed offset press work, bindery and finishing. Any continued emphasis on the development of understanding and skill in letterpress printing is not consistent with contemporary need of this industry.
2. The type of education program that would be of most benefit to both the industry and the student would be a broad industrial arts type program designed to explore the technology which underlies graphic communications and to determine and develop interest in these areas. These programs should stress the development of such characteristics as good work habits and attitudes, dependability, and ambition.
3. Education programs should place increased emphasis on developing student interests in the graphic communications industry.
4. Instructional programs should place additional emphasis on developing technical knowledge of science-oriented areas which are becoming increasingly important to graphic communications technology. These include chemistry, electronics, mathematics, and photography.
5. Vocational- and occupational-oriented education, training and retraining programs must place emphasis on the development of contemporary job skills in most production areas. Special emphasis should be placed on skill-building activities in offset lithography, screen process printing, and flexographic printing.[117]

Strandberg[118] had conducted a nationwide study of vocational printing instruction and printing industry in 1963. His investigation initially included 242 schools with federally reimbursed vocational instruction and 1000 printing plants across the United States employing twenty to fifty persons. Usable data were received from 293 commercial printing shops and from 148 schools.

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[116] Graphics Markets Division, op. cit., p. 5.

[117] Ibid., pp. 6-7.

[118] Clifford Eugene Strandberg, "A Comparison of Selected Industrial Practices With Those Taught In High School Vocational Printing Classes" (unpublished Doctor's dissertation, Texas Agricultural and Mechanical University, 1963).

As a result of his findings Strandberg provided several conclusions related to this study. The following three paragraphs summarize his conclusions.

Photoengraving, stereotyping and electrotyping have become highly specialized areas and are practiced primarily in specialty plants. Proofreading has become highly specialized and is done by specialty personnel in a majority of commercial plants. Hot metal machine operation and maintenance has become a specialized division of the letterpress composition area.

There was not a close relationship between education and industry in the teaching and use of industrial printing practices. Industrial use of offset lithography composition, offset camera and platemaking, and offset presswork greatly exceeded the teaching emphasis of education. Most schools are providing training on a lesser number of machines and equipment than are found in industry. Industry relies heavily upon automatic presses, while education places more emphasis on hand-fed presswork. Schools have not adopted the labor and time saving devices presently used in the printing industry.

Bindery operations are practiced to a greater extent in commercial plants than are being taught in schools. Industry exceeds education in the adoption of specialized bindery machines and equipment.[119]

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[119] Ibid., pp. 115-116.

Studies in Other States

Dr. J. Page Crouch[120] directed a study of graphic arts in the South Carolina labor market region in 1971 and 1972. The procedures followed in the research by Crouch were used as a pattern for much of the present investigation. The information forms contained content and a format which also served as a guide for the present study.

The purposes of the study by Crouch were to identify (1) skills and technical knowledges needed by employees, (2) processes and types of equipment in use, (3) sources of labor, and (4) opinions of employers concerning personnel training.

Data were obtained describing the graphic arts industry in the Carolinas and Georgia by a postcard survey for general information and a long form for technical information. Fifty-nine company representatives were interviewed for opinions and needs in terms of manpower training. Responses were received from 882 of the 1775 companies that were mailed the short form. The long form was mailed to these respondents and the 523 companies completing the form provided data for this portion of the study.

Crouch made the following conclusions which relate to this study:

> The industry in the Carolinas and Georgia is predominately an offset and letterpress industry with offset the considerably more prevalent process. Based on this finding, the educational programs will serve the industry and the student best if instruction is included in both processes. . . . The greatest shortage of qualified personnel are in the areas of presswork, layout and design, composition, and photography in that order. . . .

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[120] J. Page Crouch, David W. Dailey and Shirley Gunter, Graphic Arts Industry and Technology In the South Carolina Labor Market Region With Implications For Curriculum Development, Final Report, Project No. 1-D-027, Grant No. OEG-4-71-0064 (Clemson: U. S. Department of Health, Education and Welfare, 1972).

> . . . educational facilities should be equipped with machines including offset duplicators and small presses. . . .
> . . . a basic course in drafting or mechanical drawing, taken prior to, or concurrently with a course in graphic communications would be a significant aid in developing the background needed. . . . programs stressing precise adherence to directions, and the highest levels of quality throughout all phases of the course. . . best serving the student and the industry.
> . . . the majority of production areas require employees knowledgeable and skilled in the most common elements of all areas, rather than allowing them to specialize in the high school pre-work state of their careers. . . . post high school institutions will need to implement more specialized courses for employees advancing on the job and for graduates of the high school programs having the ability and displaying the readiness for continued study. . . .
> . . . Respondents expressed a clear desire for sales and management personnel with college training in the graphic arts. Post high school programs would provide a source of students, having made their occupational choice, for entry or transfer into degree level programs at the four year institutions. . . .
> . . . instructors and company representatives need to establish contact in order to maximize the benefits from their mutual efforts, namely, the upgrading of the educational programs, and the obtaining of qualified employees for the companies. . . . the ideal course is one which has a planned series of experiences for the student without the dictates of production. . . .
> . . . sound instructional unit in reproduction photography, stressing skills in line and halftone work, is needed as an inherent part of the graphic communication course.
> . . . opportunities exist for both men and women in all areas with only one exception. The large size presses might be found best suited to male workers. Cold composition and copy preparation are areas especially well adapted to women. . . .[121]

In the 1964-65 school year Hoots[122] studied graphic arts education in the secondary schools of North Carolina. He attempted to determine the status of graphic arts only in the industrial arts curriculum of that state and to identify the desirable graphic arts curricular content for the state's secondary school and teacher education programs.

He studied 303 schools in collecting data for his investigation.

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[121] *Ibid.*, pp. 110-112.

[122] William R. Hoots, Jr., "Graphic Arts Education In the Public Schools of North Carolina, With Implications For Teacher Education" (unpublished Doctor's Dissertation, George Washington University, 1969).

Of the 250 responding schools only twenty-five offered graphic arts; however, forty-five indicated a plan to add graphic arts to their curriculum. He found that the majority of graphic arts instruction in North Carolina was in the general shop program; however, more was available at the senior high level than at the junior high level. About half of the schools offering graphic arts made it available to girls and over seventy percent provided no textbooks. About one third of the graphic arts programs lacked the equipment to teach an adequate offering.

Only slightly over one-third of the teachers had college credit in graphic arts and only one in six had industrial experience in graphic arts. Hence, he concluded that graphic arts teachers lacked preparation to teach in the area. He also concluded that the secondary school curriculum in graphic arts (1) was narrow in scope, (2) lacked depth in subject matter, (3) was supported with inadequate equipment, (4) did not reflect industrial practices, and (5) was not as available to girls as to boys. An outline of the curriculum for graphic arts in the secondary schools of North Carolina was validated by a jury of graphic arts teacher educators, educational specialists from within the graphic arts industry, and general industrial arts educators.[123]

In another study of graphic arts in a single state, Wilson[124] surveyed the graphic arts teachers in the secondary schools of Maryland. He sent an information form to the forty-six schools in Maryland offering graphic arts. Responses were returned from thirty-eight schools--thirteen junior high schools, two junior/senior high schools, and twenty-three senior high schools.

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[123] Ibid., p. 47.

[124] Michael Clinton Wilson, "Graphic Arts Education In the Public Schools of Maryland" (unpublished Doctor's dissertation, George Washington University, 1969).

Some of Wilson's findings and conclusions related to the present study were that:

1. State and county curriculum guides were not available to all teachers.
2. Elective courses in graphic arts were inadequate to meet the needs and interests of students.
3. About half of those who do enroll in graphic arts have no textbooks.
4. Most graphic arts teachers in Maryland had inadequate facilities to teach the activities they thought desirable for their graphic arts programs.
5. Over half of the graphic arts teachers have industrial experience in graphic arts.[125]

As a result of his study, Wilson made the following recommendations:

1. Graphic arts should be made available to all students, especially those in junior high school.
2. More adequate facilities should be made available for teaching graphic arts and provision should be made for including graphic arts laboratories in the newer high schools.
3. Study committees should be established between industry and the schools in order that graphic arts may reflect modern technology.
4. A curriculum committee should be established at the state level to develop a state curriculum guide and county curriculum guides should be updated and made available to all teachers.
5. Adequate elective courses in graphic arts should be made available to meet special needs and interests of pupils and textbooks should be made available to all graphic arts students.

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[125] *Ibid.*, p. 101.

6. Graphic arts teachers should be encouraged to continue their formal training or education in their field at the graduate level and opportunities should be made available for further specialized training during the summers through workshops or approved institutes.

7. Expanded research efforts should be financed and carried out concerning graphic arts in the state of Maryland.[126]

Robertson conducted a study in 1969 to determine the need for additional graphic arts programs in the public schools and technical colleges of Utah. To gather the data for his investigation, he mailed 189 questionnaires and conducted interviews in forty plants. His study revealed (1) a ratio of less than 100 trainee completions to more than 200 estimated job openings and (2) a lack of production experience on the part of trainees.

Robertson's recommendations were that:

1. Closer cooperation be established between education and industry.

2. More production-type projects be used in schools with production standards and techniques approached.

3. More cooperative training programs be established between education and industry.

4. Another vocational-technical school be established in the state of Utah.

5. More high school graphic arts offerings be established in industrial arts for guidance and awareness.[128]

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[126] Ibid., pp. 102-103.

[127] Van H. Robertson, Utah Communications Industry Survey, Final Report, Project No. 6-3046, Grant No. OEG-4-7-063046-1612 (Salt Lake City, U. S. Department of Health, Education and Welfare, 1969).

[128] Ibid., p. 18.

Graphic Arts in Post-Secondary and Higher Education

A number of additional studies compared industrial practices in graphic arts to teacher education and post-secondary technology programs in graphic arts.

Research Related to Teacher Education

In a nationwide study reported in 1970, Glogovsky[129] studied the extent to which industrial arts teacher education institutions are including contemporary industrial processes in the graphic arts curriculum for future industrial arts teachers. He gathered data for his study through two questionnaires composed of graphic arts processes. One questionnaire was sent to 135 graphic arts industries in the United States which had a net capital worth of at least $300,000. The second questionnaire was sent to a graphic arts instructor at each of the 117 teacher education institutions which offered graphic arts.

As a result of his findings Glogovsky drew the following conclusions:

1. The objective of industrial arts which aims at giving insight into and understanding of industry is only partially being met. No teacher preparation institution offered instruction on all processes recognized by industry as being extensively used and many of the more modern industrial processes were units of instruction in only a very limited number of institutions.
2. Industrial arts education institutions are not completely changing to reflect modern industrial graphic arts innovations.
3. Teacher education institutions located in large metropolitan cities do not necessarily teach contemporary graphic arts processes more extensively than rural schools.

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[129] Ronald J. Glogovsky, "A Comparison of Graphic Arts Processes Practiced By Contemporary Industry with Those Taught In Industrial Arts Teacher Education" (unpublished Doctor's dissertation, University of Northern Colorado, 1970).

4. The present procedures most often used by graphic arts teacher educators to obtain an insight and understanding of modern industrial practices are inadequate.

5. The predominance of the lecture method of presentation indicates the lack of equipment and facilities to teach the processes directly by demonstration or manipulation.

6. There is a lack of uniformity in course offerings and curricular content in graphic arts at industrial arts teacher education instituitions.

Glogovsky listed twenty-three processes which were used extensively by at least one-fourth of the responding industries.[130]

In an earlier study conducted at the University of Southern California in 1961, Carlsen[131] studied the existing college technical curriculum for prospective graphic arts teachers, the relationship of technical college programs to practices in industry, and the recommendations concerning college programs by leaders in education and industry.

He concluded that over sixty percent of the colleges were offering training in basic skills, but less than sixty percent were offering training in such areas as automatic platen and cylinder presswork, camera, advanced stripping, machine composition of metallic type, and automatic folder operation. Related information topics such as color separation, estimating, scheduling production, production control, cost finding and pricing, and the management of organization were recommended by industry, but were not commonly included in school curriculums.

He also concluded that programs should reflect current industrial practices and could be strengthened through closer cooperation with industry. This could be accomplished by coordinated work experience programs for prospective teachers and cooperative efforts with industry in providing instruction in new areas brought about by technological change.[132]

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[130] Ibid., p. 158.

[131] Darvey D. Carlsen, "Graphic Arts Programs For Colleges Preparing Industrial Arts Teachers" (unpublished Doctor's dissertation, University of Southern California, 1961).

As a result of Carlsen's findings he recommended specific requirements for a college program for the preparation of graphic arts teachers.[133]

In 1954 Weir[134] conducted a survey of educators and industry to develop a recommended graphic arts program for technical preparation of industrial arts teachers. For that earlier period of time, he reported that:

> Industrial art teachers and specialists surveyed felt that graphic arts taught as industrial arts should be presented as a general area for exploration with a minimum of emphasis placed on technical or vocational skills. Visits to graphic arts school shops found a contradictory situation. Very few were found to contain facilities for activities other than hand composition and presswork. There was noted a tendency toward specialization in the examination of teaching materials.
>
> Industry representatives felt that industrial art graphic arts classes should provide broad applications of the subject with little emphasis on skill. . . . The majority of the persons surveyed felt that the teacher educational institutions must be looked to for leadership and future direction and that they would profit from counsel of qualified representatives of industry. Only about 12% of the respondents favored production work in the school shop and about 43% felt some production was acceptable if it could be controlled by the teacher.[135]

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[132] _Ibid_., pp. 149-166.

[133] _Ibid_., pp. 160-164.

[134] Thomas S. Weir, "A Graphic Arts Program In the Collegiate Level" (unpublished Doctor's dissertation, Oregon State University, 1955).

[135] _Ibid_., pp. 16-17.

Post-Secondary Technology and Management

In 1970 Cox[136] reported a study of the printing industries and printing instruction in seven mid-southern states,including Missouri. He sent questionnaires to 150 teachers of graphic arts and to 283 employers in the printing industry. He attempted to determine if there was a significant difference between the educational experiences of prospective printing employees and the educational experiences deemed important by employers in the printing industry and to recommend changes if differences did exist.

In the abstract of his study Cox cites the following conclusions as a result of his findings:

> 1. Many items of printing education were not receiving the emphasis in the classroom that employers of printers thought they should receive.
> 2. A small number of items of printing education were receiving more emphasis in the classroom than employers of printers thought they should receive.
> 3. The area of relief printing was being taught essentially as the printing industry thought that it should be taught.
> 4. Educators were placing a proper amount of emphasis on most items included in the area of offset printing (advanced skills were slighted).
> 5. In the area of related information and skills, educators were placing too little emphasis on a third of the items, were placing the proper amount of emphasis on a third of the items, and were placing more emphasis than is necessary on a third of the items.
> 6. Educators place too little emphasis in the area of managerial functions.
> 7. Even though the area of personal characteristics was being emphasized properly by educators, it was given more emphasis by industry than any other area studied, (except pride in workmanship and initiative).

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[136] Robert L. Cox, "A Study to Determine the Extent to Which Graphic Arts Education Is Filling the Needs of the Graphic Arts Industry" (unpublished Doctor's dissertation, University of Arkansas, 1970).

In a study conducted by Cherry[137] in the early 1970's, the opinions of lithographers and printing teachers in Michigan were compared with respect to job entry skills required for a beginning worker in lithography. For this study Cherry divided the lithography industry into four main areas: cameraman, stripper, platemaker, and lithographic pressman.

The employees used in the study were lithographic printers representing companies employing 10 to 200 employees. The teachers were vocationally competent graphic arts instructors in the two-year colleges in Michigan offering an occupational program in printing or graphic arts technology.

Cherry's conclusions were that:

1. The lithographic industry and teachers of selected community colleges printing programs in State of Michigan are in accord to a high degree on the knowledge needed by a potential employee at the time of job entry. They agreed on fifty of the fifty-nine identified major tasks.
2. Teachers are teaching 94.5 percent of the major tasks considered necessary by industry (52 of 55 tasks).
3. Union and non-union agreed on major tasks, minor tasks and technical information identified by the study.
4. Personality traits desired by union and non-union of entry level employees are very similar. (Top four personality traits were: attitude, dependability, cooperation, and initiative)[138]

Detailed job entry tasks and technical information necessary for employment were validated and presented in Cherry's study.[139]

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[137] Roger W. Cherry, "A Comparison of the Technical Knowledge Required For Job Entry Into the Lithographic Industry With the Knowledge Taught By Selected Schools of Printing In the State Of Michigan" (unpublished Doctor's dissertation, Wayne State University, 1972).

[138] *Ibid*., pp. 106-138.

[139] *Ibid*., pp. 98-99.

In 1970 Gray[140] reported a study of the newspaper publishing industry in Texas to assess manpower needs and the adoption of technological changes by 1980. Seventy-one of the ninety-six newspaper plants participated in the study.

Gray found that many daily newspapers were changing from the letterpress to the offset process. An anticipated related decline in hot metal typesetting machines and strike-on machines would be offset by a planned increase in phototypesetters and general purpose computers for typesetting by 1980. Likewise many newspapers planned to phase out stereotypes and to add automatic plate processors. Increases in press speed and page capacity, the use of electronic controls, the use of four-color process printing, and additional presses were anticipated. Camera departments will increase their use of silver reclamation units, automatic film processors, and in-plant color separations.

A total of ninety-one job vacancies were reported, with thirty-three in mechanical departments and seventeen in management. A decline in the jobs of typesetting machine operator, compositor, stereotype superintendent, stereotyper, and electronic engraver was predicted by 1980. A high school education was considered to be the highest level of educational attainment necessary for mechanical department personnel and seventy percent of the respondents did not consider a college degree necessary for management personnel. Therefore, in-plant training and apprenticeship training were considered to be the major sources of graphic arts manpower training in the future.

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[140] Thomas E. Gray, "Manpower Needs and the Adoption of Technological Changes Among Daily Newspapers In the State of Texas By 1980" (unpublished Doctor's dissertation, Texas Agricultural and Mechanical University, 1970).

In a nationwide study reported in 1958, Goetz[141] compared industry and post-high school graphic arts instruction. His comparisons included (1) the current practices in selected graphic arts areas (2) the machines used in printing, and (3) the attitudes of industry toward teaching methods in graphic arts education.

Goetz's survey includes questionnaires to 1004 job printing firms employing over fifteen employees and to 121 teachers from post-high school institutions. A total of 374 commercial printing firms returned the information forms. Goetz concluded that:

1. The various training areas in the post-high school institutions and the actual printing areas in the commercial plants are not closely related.
2. There is not a very close relationship between the practices followed in training programs for printers at post-high school level and those used in the printing industry. The schools are slow in adopting new methods and in using time saving equipment in several areas.
3. The post-high school institutions are providing vocational training on a minimum number of different types of machines and do not have the modern expensive printing equipment for training purposes which are used in commercial plants.
4. The post-high school institutions are not providing sufficient training for process color work in photography and presswork.[142]

Vequist[143] directed attention to the manager of the printing plant in his study surveying their upgrading interests in the areas of plant administration, printing technology, and production management. He sampled 200 of the 510 printing establishments in Kansas and received a 93.5 percent response on his questionnaire. He found that ninety-seven percent of the establishments were primarily using offset or letterpress processes. The following general findings were reported:

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[141] Robert E. Goetz, "Industrial Printing Practices Compared With the Teaching of Printing In post-High School Institutions" (unpublished Doctor's dissertation, University of Missouri--Columbia, 1958).

[142] *Ibid.*, pp. 182-183.

[143] David G. Vequist, "A Study Of the Upgrading Interests of Kansas Printing Plant Managers" (unpublished Doctor's dissertation, Kansas State University, 1973).

1. In-plant administration had the highest interest in employee, sales, training, and plant layout.
2. In production management the highest interest was in the areas of cost, quality control, production control, work measurement, materials, supervision, and inventory.
3. In printing technology the highest interest was in copy preparation, composition, photography, and film assembly.
4. Managers were willing to travel.
5. High volume non-lithographic commercial printing managers are not willing to travel.
6. Letterpress plant managers had no interest in plant administration.
7. Plant managers of sheet offset were interested in printing technology.
8. High volume letterpress had no interest in printing technology.[144]

Baab[145] studied the performance and knowledge conpetencies required for the technical positions of sales representative, mid-management, and production supervisor in the graphic arts industry in Illinois. He identified four levels of skill competency: (1) skilled performance, (2) entry skill, (3) basic performance, and (4) not necessary--and four levels of knowledge competency--(1) ability to analyze and solve problems, (2) knowledge of terminology, (3) awareness of facts, and (4) no knowledge required.

For the combined three technical positions the highest performance level, "skilled performance", was thought to be necessary for the areas of: meeting consumer needs, cost estimating, printability, the printing image carriers for lithography, different methods of production, advantages of each method, different methods of binding, arithmetic, public and industrial relations, minority group problems, labor relations, industrial psychology, expediting, budgeting, material handling, space utilization, purchasing, scheduling, inventory, and quality control.

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[144] Ibid., pp. 37-70.

[145] John C. Baab, "A Study of the Competencies Needed By Graphic Arts Workers In Technical Positions" (unpublished Master's thesis, Illinois State University, 1969).

The highest knowledge level, "ability to analyze and solve problems," was thought to be necessary by a majority of respondents for the combined three technical positions for the areas of: meeting consumer needs, cost estimating, artistic work, paste-up techniques, characteristics of color, color reproduction, printability of paper, the printing image carriers for lithography, different methods of production, advantages of each production method, press operation, lock-up and imposition, makeready, different methods of binding, arithmetic, algebra, industrial safety, public and industrial safety, minority group problems, labor relations, industrial psychology, expediting, budgeting, material handling, space utilization, purchasing, scheduling, and quality control.

"Not necessary" was indicated by a majority of respondents as being the appropriate skill level for the areas of: marketing problems, artistic work, lighting techniques, film emulsions, different kinds of lenses, developing chemicals, densitometry, characteristics of color, optical scanning, strike on composition, mechanical typesetting, photographic typesetting, electronic typesetting, spacing systems, computer programming, paper pulping and bleaching, proper inks for different methods, testing of inks, the printing image carriers for gravure, relief and screen process, geometry, calculus, electronics, physics and optics. Likewise, "no knowledge required" was the majority opinion knowledge level of the respondents for the areas of: different kinds of lenses, strike-on composition, computer programming, paper pulping and bleaching, paper sizing, testing of inks, geometry, calculus, electronics, physics, and optics.[146]

Other topics required skill and/or knowledge at levels between these highest and lowest designations.

Rieth[147] did an earlier study in 1965 as he attempted to identify a list of trade and managerial competencies needed by college level students for supervisory and managerial positions in the printing industries of Indiana. To obtain his data Rieth interviewed representatives of the 88 industries with more than 25 employees. Information forms were sent to a 10 percent random sample of the 375 smaller plants. A total of 52 competencies were identified in this investigation.[148]

The following conclusions were presented in the study:

1. The development of communications skill, principles and knowledge of major printing processes, applications of electronic devices, paper knowledge, and marketing principles are necessary fundamentals to a printing management program.
2. Managerial responsibilities which students must possess for employment in printing management include development of accurate cost information, use of correct trade terminology, and ability to establish profit and production controls.
3. Successful management training should include the ability to manage through people and the ability to delegate responsibility and authority.[149]

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[146] Ibid., 212-221.

[147] Claude E. Rieth, "Competencies Needed By College-Level Printing Technology Students For Effective Placement In Supervisory and Management Positions In Indiana Printing Industries" (unpublished Doctor's dissertation, Indiana University, 1966).

[148] Ibid., pp. 23-29.

[149] Ibid., p. 84.

Graphic Arts Curriculum Guides

A state supervisor of industrial education in each of the fifty states was asked to identify state or local graphic arts curriculum guides available in his state. (See Appendix C).

The following states published one or more separate curriculum guides in graphic arts: Florida, Georgia, Hawaii, Minnesota, Nebraska, New Jersey, Ohio, Pennsylvania, Texas, Vermont, and Virginia. Graphic arts was included in the general industrial arts curriculum guides in Louisiana, New Mexico, New York, and South Dakota. Iowa and Maine had guides in progress. Puerto Rico and Alberta also had curriculum guides in graphic arts. Certain counties or cities were idenitified which had local guides in the states of Alaska, California, Florida, Idaho, and Washington.

Eleven other states responded by saying no state guides in graphic arts were available. These states were: Alaska, California, Colorado, Delaware, Idaho, Kansas, Maryland, Michigan, North Dakota, Rhode Island, and Washington.

A list of the curriculum guides identified in this portion of the study is provided in the Selected Bibliography.

Chapter 3

SURVEY OF GRAPHIC ARTS INSTRUCTION IN THE PUBLIC SECONDARY SCHOOLS OF MISSOURI

In order to identify present secondary school offerings in graphic arts throughout Missouri as part of the Missouri Industrial and Educational Graphic Arts Survey (MIEGA), two survey forms were developed and mailed to all schools in the state to identify those offering graphic arts. The second form was mailed to those who indicated on the first form that they offered graphic arts.

Initial Short Form

Selection of Population

To begin the survey, it was necessary to identify the schools which offer graphic arts instruction in Missouri. The 1973-1974 edition of the Industrial Arts Education Personnel Directory, distributed by the Missouri State Department of Elementary and Secondary Education, lists all public schools with industrial arts offerings in Missouri and their current teachers, as well as the directors of all area vocational schools in the state.

For purposes of this study, schools were divided into three categories: junior high, comprehensive junior/senior high, and vocational-technical. The junior high schools were those organizations with a separate junior high structure; the comprehensive schools were those secondary schools without separate junior highs, as well as the senior highs in a district with separate junior and senior highs; and the vocational-technical schools were those separate high schools for vocational purposes.

One instructor from each school was selected to receive an information form related to the graphic arts instruction offered in that school. The project director selected the instructor who was to receive the information form, attempting to select an instructor most likely (1) to know about the schools graphic arts offering and (2) to respond to the form.

If the school was known to offer graphic arts, a graphic arts teacher was asked to complete the form. When the project director knew nothing about the graphic arts offering in the school, but knew that one of the instructors was likely to respond, he selected that instructor to receive the questionnaire. If no instructor in the school was known by the project staff, the first instructor listed in the Personnel Directory was usually selected to receive the form. A total of 683 schools were identified to receive the initial information form.

Analysis of Responding Schools

The information form shown in Appendix D was developed and mailed to the 683 teachers on April 10, 1975. A follow-up mailing was made to the 462 non-respondents on May 2, 1975 (See Appendix D). Table 5 shows that of the 683 schools contacted, 387 or 56.67 percent returned usable responses for the study. Six other schools or 0.88 percent returned unusable forms which had the school identification removed and therefore could not be classified. The remaining 290 schools made no response.

In order to identify whether the responding schools were randomly distributed in the same proportion as the population of the initial mailing, a chi square analysis was made. Table 6 shows that the percentage

Table 5

SCHOOLS RETURNING INITIAL SHORT INFORMATION FORMS

Response Category	Number	Percent
Usable Returns	387	56.67
Unusable Returns	6	0.88
Not Returned	290	42.45
Total Forms Mailed	683	100.00

Table 6

DISTRIBUTION OF ALL SCHOOLS, RESPONDING SCHOOLS, AND RESPONDING SCHOOLS OFFERING GRAPHIC ARTS IN THE INDUSTRIAL EDUCATION CURRICULUM BY TYPE OF SCHOOL

	Total Sch. Initial Mailing		Total Resp. Sch.		Resp. Sch. with G.A. in Ind. Ed.	
Type of School	#	%	#	%	#	%
Junior High	179	26.2	101	26.1	17	20.7
Comp. Jr./Sr. High	446	65.3	242	62.5	48	58.6
Voc.-Tech. High	58	8.5	44	11.4	17	20.7
Total Schools	683	100.0	387	100.0	82	100.0

of junior high schools in the initial mailing was 26.2 percent, a figure almost identical with the 26.1 percent of junior highs among the responding schools. Likewise the percentages of comprehensive schools in the initial mailing and in the responding group were nearly the same--65.3

percent and 62.5 percent respectively. The 8.5 percent of vocational schools in the initial mailing is not far below the 11.4 percent in the responding group.

The chi square value of 4.200 shown in Table 7 is below the critical value of 5.991 for the .05 level of confidence and two degrees of freedom. Hence, the responding schools are distributed proportionately among the three types of schools in the same relationship as all of Missouri's secondary schools.

Table 7

CHI SQUARE ANALYSIS FOR DISTRIBUTION OF RESPONDING SCHOOLS BY TYPE OF SCHOOL

Type of School	Observed Frequency (f_o)	Expected Frequency (f_e)	Difference (f_o-f_e)	$\frac{(f_o-f_e)^2}{f_e}$
Junior High	101	101.4	-0.4	0.002
Comp. Jr./Sr. High	242	252.7	-10.7	0.453
Voc.-Tech. High	44	32.9	11.1	3.745
Totals	387	387.0	0.0	4.200

Critical value for chi square with 2df at .05 level = 5.991.

Analysis of Data From Short Information Form

Table 8 shows that graphic arts within the industrial education program was offered by 82 schools or 21.2 percent of the 387 usable respondents. Another 58 of the schools (15.0 percent) offered some graphic arts instruction as part of another curriculum area, such as art, business, journalism, or science. The remaining 247 respondents, or 63.8

percent, indicated that no graphic arts instruction was presently offered in the school, either in industrial education or any other area of the curriculum.

Table 8

GRAPHIC ARTS OFFERINGS IN RESPONDING SECONDARY SCHOOLS OF MISSOURI BY TYPE OF SCHOOL

	Junior		Comp. Jr./Sr.		Voc.-Tech.		Total	
Response Category	#	%	#	%	#	%	#	%
Graphic Arts in Ind. Ed.	17	4.4	48	12.4	17	4.4	82	21.2
Graphic Arts in Other Dept.	15	3.9	38	9.8	5	1.3	58	15.0
No Graphic Arts	69	17.8	156	40.3	22	5.7	247	63.8
Totals	101	26.1	242	62.5	44	11.4	387	100.0

Of the total of 387 returning usable responses, Table 8 shows that 101 schools (26.1 percent) were separate junior high schools, 242 schools (62.5 percent) were comprehensive junior-senior high schools and 44 schools (11.4 percent) were vocational-technical high schools. Since 293 of the original 446 schools (65.7 percent) listed as comprehensive schools were secondary schools without a separate junior high school structure in the district and since the responding group of schools was found to be representative of all Missouri schools, it is estimated that the responding comprehensive school category includes about 83 senior high schools and 159 combined junior-senior high schools.

The data presented in Table 8 indicated that 63.8 percent, or nearly two-thirds of all secondary schools in Missouri, had no graphic arts instruction in 1975. Only about one of each five schools (21.2 percent) included graphic arts as part of the industrial education offerings.

The percentage of the vocational-technical secondary schools offering graphic arts appeared somewhat better than that of the other secondary schools of Missouri. One-half of the forty-four vocational-technical high schools offer graphic arts either in industrial education (seventeen schools) or in other departments (five schools).

In order to identify whether the vocational-technical schools indeed had a significantly higher proportion of schools offering graphic arts in the industrial education curriculum, a chi square statistical analysis was made. Table 6 on page 73 shows the percentage of each type of school included in the entire responding population and the responding schools offering graphic arts in industrial education. The vocational-technical schools make up 20.7 percent of the schools with graphic arts, but only 11.4 percent of all schools responding.

In Table 9 the chi square analysis shows that the chi square value of 7.49 obtained is indeed higher than the critical value of 5.99 at the five percent level of confidence with two degrees of freedom. The responding schools offering graphic arts instruction included more vocational schools than would occur by chance.

In addition to the eighty-two schools offering graphic arts in industrial education in 1975, Table 10 shows that an additional thirty-eight schools, or 9.8 percent, indicated that they planned to add graphic arts instruction by 1977. Even with these additions, only 31.0 percent of Missouri's secondary schools would offer any graphic arts instruction.

The projections for the vocational-technical schools shown in Table 10 indicated that nearly half of these schools planned to offer

Table 9

CHI SQUARE ANALYSIS FOR DISTRIBUTION OF GRAPHIC ARTS OFFERINGS BY TYPE OF SCHOOL

	Observed Frequency (f_o)	Expected Frequency (f_e)	Difference (f_o-f_e)	$\frac{(f_o-f_e)^2}{f_e}$
Junior High	17	21.4	-4.4	.90
Comp. Jr./Sr. High	48	51.3	-3.3	.21
Voc.-Tech. High	17	9.3	7.7	6.38
Total	82	82.0	0.0	7.49*

*Statistically significant at .05 level where chi square critical value with 2df = 5.991.

graphic arts as part of industrial education by 1977--the seventeen in 1975 plus four by 1977 or a total of twenty-one of the forty-four responding schools.

Telephone Follow-Up of Short Form

In order to check the randomness of the respondents completing the initial information form, it was decided that ten percent of the non-respondents would be contacted by telephone and asked to respond to the information included on the initial form sent to each school. Hence, thirty of the 290 non-responding schools were randomly selected and telephoned. From the information gathered via telephone and presented in Table 11, it was found that four of the thirty schools (13.3 percent) offered graphic arts instruction in industrial education. Another twelve schools (40.0 percent) indicated that some graphic arts was offered at the school in another department. It was believed that this number was

Table 10

SCHOOLS WITH POTENTIAL GRAPHIC ARTS OFFERINGS IN INDUSTRIAL EDUCATION CURRICULUM BY 1977 BY TYPE OF SCHOOL

	Junior		Comp. Jr./Sr.		Voc.-Tech.		Total	
Response of School	#	%	#	%	#	%	#	%
Graphic Arts in Ind. Ed. in 1975	17	4.4	48	12.4	17	4.4	82	21.2
Plan to Add Graphic Arts by 1977	13	3.4	21	5.4	4	1.0	38	9.8
No Graphic Arts Planned in Ind. Ed. by 1977	71	18.3	173	44.7	23	6.0	267	69.0
Totals	101	26.1	242	62.5	44	11.4	387	100.0

Table 11

DISTRIBUTION OF "NON-RESPONDING" SCHOOLS ON TELEPHONE FOLLOW-UP BY RESPONSE TO GRAPHIC ARTS INSTRUCTION AND BY TYPE OF SCHOOL

	Junior		Comp. Jr./Sr.		Voc.-Tech.		Total	
Response Category	#	%	#	%	#	%	#	%
No Graphic Arts	4	13.3	10	33.3	0	0.0	14	46.7
G.A. in Ind. Ed.	1	3.3	2	6.7	1	3.3	4	13.3
No G.A. in Ind. Ed., Plan to add by 1977	0	0.0	0	0.0	0	0.0	0	0.0
No G.A. in Ind. Ed., but in Other Depts.	3	10.0	9	30.0	0	0.0	12	40.0
Totals	8	26.7	21	70.0	1	3.3	30	100.0

inflated due to the fact that the information was gathered by telephone. For example, several respondents indicated that there was "probably some graphic arts" being included in the instruction at their school. No school responding via telephone was planning to add graphic arts to their industrial education curriculum by 1977. The remaining fourteen respondents (46.7 percent) offered no graphic arts instruction.

The chi square analysis indicated that the respondents to the initial form and the ten percent telephone sample of non-respondents were from the same population with respect to the number of schools offering graphic arts in industrial education. The chi square value of 1.14 shown in Table 12 is well below the critical value of 3.84 for the five percent level of confidence and one degree of freedom.

Table 12

CHI SQUARE ANALYSIS FOR DISTRIBUTION OF TELEPHONE FOLLOW-UP RESPONSES REGARDING GRAPHIC ARTS IN INDUSTRIAL EDUCATION

Response Category	Observed Frequency (f_o)	Expected Frequency (f_e)	Difference (f_o-f_e)	$\frac{(f_o-f_e)^2}{f_e}$
No G.A. in Ind. Ed.	26	23.6	-2.4	0.24
G.A. in Ind. Ed.	4	6.4	2.4	0.90
Totals	30	30.0	0.0	1.14

Critical value for chi square with one degree of freedom at the .05 level = 3.84.

As was anticipated, a more detailed analysis showed that the number of schools indicating an offering of graphic arts in other departments was significantly different between respondents on the information form and telephone respondents. The chi square value of 14.76 shown in Table 13 is well above the 5.99 critical value for five percent level of confidence and two degrees of freedom. Although the statistical significance was shown to be highly significant using the chi square technique, some statiticians may question the precision or even the appropriateness of this technique when the expected frequencies in cells are less than five.[150]

Table 13

CHI SQUARE ANALYSIS FOR DISTRIBUTION OF TELEPHONE FOLLOW-UP RESPONSES REGARDING GRAPHIC ARTS INSTRUCTION

	Observed Frequency (f_o)	Expected Frequency (f_e)	Difference (f_o-f_e)	$\frac{(f_o-f_e)^2}{f_e}$
No Graphic Arts	14	19.1	5.1	1.36
G.A. in Other Departments	12	4.5	-7.5	12.50
G.A. in Ind. Ed.	4	6.4	2.4	0.90
Total responses	30	30.0	0.0	14.76*

Critical value for chi square at .05 confidence level and with 2df = 5.99.

Comprehensive Long Forms

Development and Mailing of Forms

Longer forms were developed covering three areas: Form 1--The Graphic Arts Instructor; Form 2--General Information on Graphic Arts; and Form 3--Graphic Arts Course Content.

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[150] Merle W. Tate, Statistics in Education and Psychology, (New York: The Macmillan Company, 1965), pp. 294,302.

The longer forms were prepared and reviewed by four project staff members; reviewed by three secondary graphic arts teachers, four university instructors, and the State Supervisor of Industrial Arts; revised as recommended by these reviewers; and printed by the project staff. (See Appendix D)

These forms were mailed to the eighty-two schools that responded to the short form and indicated that graphic arts was included in the industrial arts curriculum. In addition, forms were mailed to seven additional schools that did not respond to the first questionnaire but were known to offer graphic arts. Hence, the longer forms were mailed to eighty-nine Missouri schools.

The following forms were included in the mailing: one copy of Form I for each teacher of graphic arts, one copy of Form II for each school, and Form III for each course offered in that school. In a few cases an inadequate number of forms was mailed, either because of incorrect information provided on the short form or misinterpretation of the data by the project staff. So data were incomplete for a few schools.

The initial mailing of the longer forms were made on May 15, 1975. Follow-up telephone calls were made and/or follow-up letters were mailed to all non-respondents during June and July. Since it was summer break for most instructors, it was difficult to locate or contact some of them; hence, the follow-up procedure continued over a two-month period.

Table 14 shows that responses were received from sixty-four, or 71.9 percent, of the eighty-nine schools. Telephone conversations with approximately ten respondents revealed that these schools offered no graphic arts in spite of indicating some graphic arts offerings on the short form. These responses were included in the study even though several of these forms were never returned. It was also discovered that in two schools two teachers had been sent forms for their school; hence, a total of sixty-two schools responded to the long forms.

Table 14

DISTRIBUTION OF RETURNS OF LONG FORMS
SURVEY BY TYPE OF SCHOOL

	Junior		Comp. Jr./Sr.		Voc.-Tech.		Total	
Response Category	#	%	#	%	#	%	#	%
Responding Schools	18	20.2	34	38.2	12	13.5	64	71.9
Non-responding schools	5	5.6	14	15.7	6	6.7	25	28.1
Total schools sent long form	23	25.8	48	53.9	18	20.2	89	100.0*

*Totals may not equal 100% due to rounding.

A total of forty-two secondary schools responding to the long forms offered graphic arts instruction and provided data for that portion of this investigation. Table 15 shows this to be 65.6 percent of those schools which responded. One interesting aspect of this portion of the study was the fact that 20 respondents (31.3 percent) stated on the short form that graphic arts was offered in that school; however, when the long form followed, the responses to it indicated that no graphic arts was actually offered in these schools. This discrepancy occurred in spite of the brevity of the short form and the scope of the definition of "graphic arts" given on the short form.

Analysis of Data From Form I--Graphic Arts Instructors

The first part of the secondary educational survey of graphic arts instruction involved Form I of the instrument. Each instructor was to

Table 15

DISTRIBUTION OF SCHOOLS RESPONDING TO LONG FORM SURVEY BY TYPE OF SCHOOL

	Junior		Comp. Jr./Sr.		Voc.-Tech.		Totals	
	#	%	#	%	#	%	#	%
Graphic Arts in Ind. Ed.	12	18.7	21	32.8	9	14.1	42	65.6
No Graphic Arts	6	9.4	11	17.2	3	4.7	20	31.3
Duplicate forms sent	0	0.0	2	3.1	0	0.0	2	3.1
Totals	18	28.1	34	53.1	12	18.8	64	100.0

complete a form. A total of fifty-four provided data for this section. These instructors represented forty-two schools.

Number Per School. The forty-one schools responding to the long forms employed a total of fifty-six graphic arts teachers or a mean of 1.36 teachers per school. All responding graphic arts teachers in Missouri were male. Table 16 shows distribution of teachers by type of school and number of instructors per school.

Approximately one of each six responding schools employed more than one graphic arts instructor. Eight of the junior high schools employed only one instructor, three employed two teachers each, and one employed four graphic arts instructors. The mean number of instructors for the junior high schools was 1.50. In the twenty comprehensive junior-senior schools responding to this item, a total of twenty-six graphic arts instructors were employed with a mean of 1.30 teachers per school. Eighteen of these schools employed one graphic arts teacher, one school employed two teachers, and one school employed six teachers. One comprehensive junior-senior high school did not respond to this item.

Of the nine responding vocational schools, eight employed only one graphic arts instructor while the remaining school employed four instructors. However, only one of these four completed the form to be included in the study.

Table 16

DISTRIBUTION OF SCHOOLS BY NUMBER OF GRAPHIC ARTS INSTRUCTORS AND BY TYPE OF SCHOOL

	Junior		Comp. Jr./Sr.		Voc.-Tech.		Total	
No. of Instructors	Instr.	Sch.	Instr.	Sch.	Instr.	Sch.	Instr.	Sch.
1	8	8	18	18	8	8	34	34
2	6	3	2	1	0	0	8	4
3	0	0	0	0	0	0	0	0
4	4	1	0	0	(4)1*	1	5*	2
5	0	0	0	0	0	0	0	0
6	0	0	6	1	0	0	6	1
Totals	18	12	26	20	(12)9*	9	(56)53*	41
No responses	0	0	1	1	3*	0	4	1
Mean Instructors Per School	1.50		1.30		1.33		1.36	

*Only one of the four instructors in one school completed the information form to be included in the study. All four were included in computing means.

Age. The mean age of the forty-eight graphic arts instructors responding to this item was 34.77 years. As might be expected the junior high school teachers had the lowest mean age of 31 years, while the comprehensive junior-senior high teachers had a mean age of 34 years, and the vocational-technical teachers had a mean age of 44 years. In Table 17 it is noted that three-fourths of all graphic arts teachers (35 of 48)

Table 17

DISTRIBUTION OF GRAPHIC ARTS INSTRUCTOR BY AGE
AND BY TYPE OF SCHOOL

	Junior		Comp. Jr./Sr.		Voc.-Tech.		Total	
Age of Instructor	#	%	#	%	#	%	#	%
over 60	0	0.0	1	4.0	2	25.0	3	6.3
56-60	0	0.0	1	4.0	0	0.0	1	2.1
51-55	0	0.0	1	4.0	0	0.0	1	2.1
46-50	1	6.7	0	0.0	0	0.0	1	2.1
41-45	1	6.7	0	0.0	3	37.5	4	8.3
36-40	1	6.7	2	8.0	0	0.0	3	6.3
31-35	3	20.0	9	36.0	3	37.5	15	31.2
26-30	6	40.0	10	40.0	0	0.0	16	33.3
21-25	3	20.0	1	4.0	0	0.0	4	8.3
Total	15	100.1*	25	100.0	8	100.0	48	100.0
Mean Age (based on midpoint of range)	31.00		33.92		44.25		34.77	
No Response	3		2		1		6	

*Totals may not equal 100% due to rounding.

were under thirty-five years of age. While almost eighty percent of the junior high and comprehensive junior-senior high schools were under thirty-five, three-fourths of the vocational-technical teachers were between ages 31 and 45. The remaining two teachers in the vocational schools were over age 60. No junior high teacher was over age fifty.

Educational Experience. As might be expected all teachers except those teaching vocational-technical classes had earned at least a baccalaureate degree. Table 18 shows that seven vocational teachers in the vocational-technical schools and two vocational instructors teaching in the comprehensive junior-senior high schools held no bachelors degrees. Of the two remaining vocational teachers, one had earned an associate degree and the other had both bachelors and masters degrees.

Table 18

DEGREES HELD BY GRAPHIC ARTS INSTRUCTORS BY TYPE OF SCHOOLS

Degrees	Junior	Comp. Jr./Sr.	Voc.-Tech.	Total
Associate Only	0	0	1	1
Associate Plus Bachelors	2	1	0	3
Bachelors Only	7	14	0	21
Bachelors Plus Masters	8	9	1	18
Bachelors, Masters, and Advanced	1	1	0	2
Total Degrees	18	25	2	45
No Degree	0	2*	7	9

*Vocational teachers within comprehensive Jr./Sr. high school.

Half of the junior high teachers (9 of 18) had earned at least a masters degree and forty percent of the teachers in the comprehensive junior-senior high (10 of 25) had earned a masters degree. Only one teacher in each the junior high and comprehensive high school reported advanced degrees beyond the masters degree.

As shown in Table 19 nine of the fifty-four graphic arts instructors included in the study had no degree. One additional instructor had earned an associate degree. All ten instructors had earned some college credit. Eight of the ten instructors had less than two years of college credit (less than sixty semester hours). Two of these instructors had earned less than fifteen semester hours of college credit, four had earned

Table 19

DISTRIBUTION OF VOCATIONAL GRAPHIC ARTS INSTRUCTORS WITH LESS THAN BACCALAUREATE DEGREE BY SEMESTER HOURS OF COLLEGE CREDIT EARNED AND BY TYPE OF SCHOOL

No. of Semester Hrs. of College Credit	Comp. Jr./Sr.	Voc.-Tech.	Total
Over 120	1	0	1
91-120	0	0	0
61-90	0	0	0
31-60	0	2	2
16-30	1	3	4
0-15	0	2	2
Total Non-Degreed Instructors	2	7*	9*

*An additional instructor indicated he held an "Associate Degree plus eight semester hours."

between sixteen and thirty semester hours, two had earned between thirty-one and sixty semester hours, and one had earned over 120 semester hours of college credit. Even though the total number of semester hours was not indicated, the instructor who had earned an associate degree did indicate that he had earned eight semester hours in addition to the degree.

Only one of the four holders of associate degrees reported the title of the degree; this was Associate of Arts. Twenty-nine of the thirty-nine responding bachelor's degree recipients had received the degree Bachelor of Science in Education. Eight had received the degree Bachelor of Science, two the degree Bachelor of Arts, and one the degree Bachelor of Science in Business Administration. The titles of the degrees held by graphic arts instructors are shown in Table 20. On the graduate level, nine of the twenty-one degrees reported were Master of Science in Education. Four had received Master of Science degrees. Several other graduate degrees were each received by one or two instructors.

Table 21 shows that over eighty percent of all degrees held by the graphic arts instructors were earned in Missouri colleges and universities. Another fifteen percent were earned in institutions within states bordering Missouri. The only degrees earned outside the Midwest were two associate degrees, one of which was completed in Germany. More than five out of every six baccalaureate and graduate degrees awarded to Missouri graphic arts teachers were earned within the state.

The majors reported by holders of associate degrees were drafting, liberal arts, and journalism/graphic arts. One instructor reported each of these majors and one failed to respond to this item.

Of the forty-three instructors responding to this item, at the baccalaureate level thirty-four had completed majors in industrial arts,

Table 20

DISTRIBUTION OF GRAPHIC ARTS INSTRUCTORS BY TITLE OF DEGREES EARNED, LEVEL OF DEGREE, AND TYPE OF SCHOOL

	Junior				Comp. Jr./Sr.				Voc.-Tech.				Total			
Name of Degree*	A	B	M	Adv	A	B	M	Adv	A	B	M	Adv	A	B	M	Adv
AA	0				1				0				1			
BS Ed		14				14				0				28		
BS		2				5				0				7		
AB		0				2				0				2		
BS and BS Ed		0				1				0				1		
BSBA		0				0				1				1		
MS Ed			6				3				0				9	
MS			1				3				0				4	
MAT			0				1	1*			0				1	1*
MA Ed			1				1				0				2	
M Ed			0				1				0				1	
MBA			0				0				1				1	
MA			0				1				0				1	
Specialist				1				0				0				1
Totals: Associate (A)	0				1				0				1			
Bachelors (B)		16				22				1				39		
Masters (M)			8				10				1				19	
Advanced (Adv)				1				1*				0				2*
Degree Titles Not Indicated	2	2	1	0	0	3	0	0	1	0	0	0	3	5	1	0

*Listed as advance degree by one respondent.

Table 21

DISTRIBUTION OF GRAPHIC ARTS INSTRUCTORS BY LOCATION OF INSTITUTIONS GRANTING THE DEGREES AND BY LEVEL OF DEGREE

Location of Degree Granting Institution	Associate		Bachelors		Masters		Advanced		Total	
	#	%	#	%	#	%	#	%	#	%
Missouri	2	50	35	83.3	16	84.21	2	100	55	82
Midwestern States	0	0	7	16.7	3	15.79	0	0	10	15
Other States	1	25	0	0.0	0	0.00	0	0	1	1.5
Foreign	1	25	0	0.0	0	0.00	0	0	1	1.5
Totals	4	100	42	100.0	19	100.00	2	100	67	100.0
Location not given	0		2		1		0		3	
Total No. of degrees									70	

Percentages of each degree level were based on degrees earned by respondents at that level; percentages of total were based on total degrees earned by respondents at all levels.

industrial education, or industrial arts and technology. Only two had majors in graphic arts or printing. The remaining seven teachers had majored in such areas as art, business, journalism, English, history, social studies, or industrial relations.

Twelve of the twenty graduate degrees earned by the responding graphic arts instructors involved majors in industrial arts, industrial education, or industrial arts and technology. Three had completed graduate majors in secondary school administration. Three of the remaining six graduate degrees were related to education. The remaining three majors were in either history or management.

Table 22 shows that the graphic arts teachers in Missouri had earned a mean of 5.4 semester hours of credit in graphic arts. Only one of the vocational teachers had college credit in graphic arts--23 semester hours. No junior high instructor had earned more than six semesters hours of credit in graphic arts. Both the junior high and vocational-technical school teachers had earned a mean of less than 3 semester hours in graphic arts. Among graphic arts instructors in comprehensive junior-senior high schools there was a greater range of college level

Table 22

DISTRIBUTION OF INSTRUCTORS OF GRAPHIC ARTS BY SEMESTER HOURS OF CREDIT IN GRAPHIC ARTS AND BY TYPE OF SCHOOL

	Junior		Comp. Jr./Sr.		Voc.-Tech.		Total	
Sem. Hours of Graphic Arts	#	%	#	%	#	%	#	%
31-36	0	0.0	1	3.7	0	0.0	1	1.9
25-30	0	0.0	0	0.0	0	0.0	0	0.0
19-24	0	0.0	1	3.7	1	11.1	2	3.7
13-18	0	0.0	5	18.5	0	0.0	5	9.3
7-12	0	0.0	6	22.2	0	0.0	6	11.1
1-6	13	72.2	7	25.9	0	0.0	20	37.0
None	5	27.8	7	25.9	8	88.9	20	37.0
Total Teachers	18	100.0	27	99.9	9	100.0	54	100.0
Mean No. of Sem. Hrs. Earned in Graphic Arts	2.83		8.11		2.55		5.42	

preparation in graphic arts. This range was from none to 34 semester hours. The mean of the comprehensive high school graphic arts instructors was 8.11 semester hours of graphic arts credit.

More than one of every three graphic arts teachers in Missouri had earned no college credit in graphic arts; more than three of every four had earned six semester hours or less.

Ten of the twenty teachers with no college credit in graphic arts taught vocational courses in graphic arts either within the comprehensive or the vocational high school organization. Although one vocational teacher with no college credit in graphic arts had only eight months of graphic arts work experience, each of the other nine vocational teachers was found to have had at least twelve years of industrial experience in graphic arts to provide necessary background for teaching graphic arts. A further examination indicated that two of the five junior high school instructors with no college credit in graphic arts had at least one year of experience in the graphic arts industries. However, in 1975 Missouri still had eight graphic arts teachers (three in junior high and five in comprehensive junior/senior high schools) with neither college credit nor work experience in the graphic arts industries.

Teaching Experience. The mean number of years of teaching experience by the graphic arts instructors in Missouri was 5.08 years in the current school, 4.49 years in the area of graphic arts, and 7.40 years in total teaching experience and is shown in Table 23.

The comparative means among the three types of schools were within a one-year range for the "years of experience in the current school" and for the "total years of teaching experience", ranging from 4.74 to 5.56 years and 6.75 to 7.59 years respectively. Since the mean length of

Table 23

DISTRIBUTION OF GRAPHIC ARTS INSTRUCTORS BY YEARS OF TEACHING EXPERIENCE, TYPE OF SCHOOL, AND TYPE OF TEACHING EXPERIENCE

Years of Teaching Experience	Junior High (N=18)			Comp. Jr/Sr High (N=27)			Voc-Tech High (N=9)			Total (N=54)		
	Sch.	GA	Total	Sch.	GA	Total	Sch.	GA	Total	Sch.	GA	Total
1-2	6	10	2	9	13	6	4	4	3	19	27	11
3-4	3	3	4	7	9	6	0	0	0	10	12	10
5-6	3	1	4	5	1	4	1	0	0	9	2	8
7-8	3	1	1	2	0	1	2	2	2	7	3	4
9-10	1	0	2	1	0	2	0	1	1	2	1	5
11-12	1	1	2	2	1	3	1	2	2	4	4	7
13-14	0	0	0	0	1	1	0	0	0	0	1	1
15-16	0	0	0	1	0	0	0	0	0	1	0	0
17-18	1	1	2	0	0	0	0	0	0	1	1	2
19-20	0	0	0	0	1	1	0	0	0	0	1	1
21-22	0	0	0	0	1	1	0	0	0	0	1	1
23-24	0	0	0	0	0	0	0	0	0	0	0	0
25-26	0	0	0	0	0	2	0	0	0	0	0	2
No response	0	1	1	0	0	0	1	0	1	1	1	2
Mean years of Experience	5.56	4.06	7.41	4.74	4.19	7.59	5.13	6.22	6.75	5.08	4.49	7.40

Sch. = years at present school; GA = years in graphic arts teaching; Total = total years of teaching experience.

teaching tenure in the current school was slightly highest among the junior high teachers (5.56 years) and lowest among the comprehensive high school teachers (4.74 years), while the mean total teaching tenure was highest for the comprehensive high school teachers (7.59 years) and lowest for the vocational teachers (6.75 years), it appears that the comprehensive high school teachers of graphic arts had changed jobs a bit more frequently than the instructors at the other schools.

As one might expect, the number of years of total teaching experience for the vocational-technical graphic arts instructors and their number of years of teaching experience in graphic arts were nearly identical. The vocational graphic arts teacher is not likely to teach in any other part of the school curriculum because of his unique certification requirements. The vocational teachers had taught graphic arts an average of more than two years longer than the teachers in the other types of schools.

Nearly all of the junior high and vocational-technical graphic arts teachers were in their school and in teaching a total of less than twelve years. This span of time would tend to parallel the development of separate junior high schools in the larger population centers and the area vocational schools throughout the state of Missouri as well as the rather recent development of graphic arts as a part of the industrial education curriculum in the state. This latter concept was further substantiated by the fact that approximately half of the graphic arts teachers in each of the types of schools had less than two years of teaching experience in graphic arts.

Industrial Work Experience. The graphic arts instructors in Missouri averaged 5.29 years of work experience in the area of graphic arts; however, thirty-four of the fifty-four teachers had no work experience in graphic arts. These data are shown in Table 24. While most teachers had no industrial experience in graphic arts, two reported related work experience ranging between thirty-five and forty-five years; however, their work apparently was not full-time as these two instructors also reported teaching experience of more than twenty-five years.

Table 24

DISTRIBUTION OF GRAPHIC ARTS INSTRUCTORS WITH INDUSTRIAL WORK EXPERIENCE BY YEARS OF INDUSTRIAL WORK EXPERIENCE, TYPE OF SCHOOL, AND TYPE OF INDUSTRIAL WORK EXPERIENCE

Years of Industrial Work Experience*	Junior High (N=18)		Comp. Jr/Sr High (N=27)		Voc-Tech High (N=9)		Total (N=54)	
	GA	Other	GA	Other	GA	Other	GA	Other
40-45	0	0	1	0	0	0	1	0
35-40	0	0	1	0	0	0	1	0
30-35	0	0	1	0	0	0	1	0
25-30	0	0	0	0	1	0	1	0
20-25	0	0	0	0	3	0	3	0
15-20	0	0	0	0	1	0	1	0
10-15	0	0	0	1	3	0	3	1
5-10	0	0	1	2	0	1	1	3
3-5	0	4	1	2	0	0	1	6
1-3	1	7	0	1	0	1	1	9
1 & Under	1	0	4	3	1	0	6	3
None	16	7	18	17	0	3	34	27
Not Given	0	0	0	1	0	4	0	5
Mean Years of Work Experience	0.17	1.73	4.79	1.44	16.98	1.43	5.29	1.57

*If the amount of industrial work experience fell exactly on one of the limits of the categories, it was tabulated as the lower of the two categories; i.e. 40 years was tabulated with 35-40 rather than 40-45.

Industrial experience in areas other than graphic arts was reported by half of the instructors. Instructors of all three types of schools reported that the mean years of work experience outside of graphic arts was approximately one and one-half years for each instructor. Although only two of eighteen junior high instructors reported graphic arts industrial experience, nearly two-thirds of the junior high teachers had non-graphic arts industrial experience ranging from one to five years. Nearly two-thirds of the comprehensive high school teachers reported neither graphic arts experience nor non-graphic arts industrial work experience. As would be expected all vocational teachers had industrial experience in their field of instruction; however, the amount of their experience was unusual. Eight of the nine vocational school teachers had from ten to thirty years of graphic arts work in industry; the other vocational school instructor had only eight months of experience in graphic arts industries. These data provided vocational school teachers with a mean of nearly seventeen years of work experience in their field.

Only two of the junior high teachers of graphic arts had work experience in graphic arts industry and they had one and two years of experience respectively. This gave junior high teachers of graphic arts a mean of only about two months of work experience in their specialty. The mean years of work experience for the teachers in the comprehensive junior/senior high school was 4.79 years.

Other Significant Experiences. When the graphic arts instructors were asked to list in-service experiences which had been most valuable to their teaching, thirty-four of the fifty-four teachers responding to the information forms failed to respond to this item. Although each teacher could have listed up to four experiences, the twenty responding teachers identified a total of thirty-two responses. The responses were grouped into nineteen categories or experiences. Experiences which were mentioned as being valuable by more than one instructor were industrial experience (6 responses), self-study (3 responses), industrial seminars or institutes (3 responses), union courses (2 responses), contact with suppliers (2 responses), graphic arts exhibits and trade shows (2 responses), and part-time student work in print shop (2 responses). These responses are shown in Table 25.

Many more responses were received when the instructors were asked to specify various professional experiences which they felt they needed most to improve their instruction. Thirty-eight of the fifty-four teachers responded to this item. A total of fifty-five responses were received and these were then assigned to twenty-two categories for tabulation in Table 26.

Ten instructors listed workshops and seminars by suppliers or technical representatives as potentially valuable, nine placed value in more college graphic arts courses, and eight listed work experience in industry as necessary experience for the future. Three respondents each listed teaching experience in graphic arts; interaction with successful teachers; in-service seminars related to plates, cameras, and/or presses; and updating printing methods as being necessary for themselves. Two respondents indicated that updating their equipment would most improve their instruction. Teachers in all types of schools averaged approximately one response per instructor.

Thirty-four of the fifty-four teachers responded to the item requesting a listing of in-service college courses desirable for

Table 25

DISTRIBUTION OF GRAPHIC ARTS INSTRUCTORS SPECIFYING OTHER IN-SERVICE EXPERIENCES AS VALUABLE TO THEIR TEACHING BY TYPE OF SCHOOL

In-service Experience	Junior High	Comp. Jr/Sr High	Voc-Tech High	Total
Industrial Work Experience	1	4	1	6
Teacher Interchange of Ideas	1	0	0	1
Self-Study	1	2	0	3
Work on Yearbook	1	0	0	1
Business Education Workshop	0	1	0	1
Hobby and Military Experience	0	1	0	1
Industrial Seminars and Institutes	0	2	1	3
College Teaching in Media Area	0	1	0	1
In-service Teaching Experience	0	1	0	1
Technical Rep. for Supplies	0	1	0	1
Union Courses	0	0	2	2
Special Courses on Equipment	0	0	1	1
Contacts with Suppliers	0	1	1	2
Visits to Print Shops	0	1	0	1
Part-time Student Work in Printing	1	1	0	2
New Vocational Teacher Institute	0	0	1	1
Field Trips	1	0	0	1
Trade Shows and Exhibits	0	1	1	2
Professional Education Courses	0	0	1	1
Total Experiences Listed	6	17	9	32
Total Teachers in Population	18	27	9	54*

*54 teachers in population--each may have identified up to four valuable experiences; 20 teachers responded to this item.

Table 26

DISTRIBUTION OF GRAPHIC ARTS INSTRUCTORS SPECIFYING VARIOUS PROFESSIONAL EXPERIENCES AS NEEDED FOR IMPROVEMENT OF INSTRUCTION BY TYPE OF SCHOOL

Needed Experiences	Junior High	Comp. Jr/Sr High	Voc-Tech High	Total
Workshops and seminars by suppliers and tech. reps.	5	2	3	10
Freedom to work with existing equipment	0	1	0	1
Course in estimating	0	1	0	1
Course in screen printing	0	1	0	1
Metrics in printing	0	1	0	1
Filing graphic arts ideas	0	1	0	1
Professional memberships and conferences	0	1	0	1
More college graphic arts courses	3	4	2	9
Photography seminars	0	1	0	1
Work experience in industry	1	7	0	8
Update printing methods	1	1	1	3
In-service--plates, camera, press	0	2	1	3
Industrial tours	1	0	0	1
Industrial lectures and demonstrations	1	0	0	1
Better graphic arts teaching methods	1	0	0	1
Interact with successful teachers	1	1	1	3
Exposure to silk screen industry	1	0	0	1
Automated typesetting	1	0	0	1
Teaching experience in graphic arts	1	1	1	3
Curriculum guide for junior high	1	0	0	1
Compare graphic arts supplies	0	1	0	1
Update equipment	1	1	0	2
Total Responses	19	27	9	55*

*54 teachers in population--each may identify up to four needed experiences; 38 teachers responded to this item.

improvement of their teaching. Their responses in Table 27 show that courses in photography were requested by seven teachers. Six and five respondents listed general offset printing and screen printing respectively. Three teachers each expressed a need for courses dealing with darkroom techniques, layout and design, and "anything in graphic arts and/or photography." Two instructors each requested courses in presswork, paste-up and stripping, and graphic arts workshops. Twenty-five other courses or categories were each listed by one respondent.

Analysis of Data From Form II--General Information On Graphic Arts Offerings

The responses to Form II provided the data for the extent of the curricular offerings in each school. A copy of Form II was mailed to each school responding to the initial short information form which indicated graphic arts offerings. Forty-two schools offering graphic arts completed usable copies of Form II and became the population for this portion of the survey.

Number of Courses and Sections. Table 28 shows that a total of twenty-six of the schools (61.9 percent) offered only one graphic arts course; eleven schools (26.2 percent) offered two courses in graphic arts; four schools (9.5 percent) offered three courses; and the remaining school offered four courses. Thus a total of sixty-four courses were offered by the respondents. Ten of the twelve junior high schools offered one course in graphic arts. Two junior high schools offered two graphic arts courses. Among the comprehensive junior-senior high schools, eight schools offered one course, nine schools offered two courses, and four schools offered three courses. Eight of the nine vocational-technical schools offered the single two-year course and the other vocational-technical school offered four courses.

Table 27

DISTRIBUTION OF GRAPHIC ARTS INSTRUCTORS SPECIFYING VARIOUS IN-SERVICE COURSES AS DESIRABLE FOR IMPROVEMENT OF THEIR TEACHING BY TYPE OF SCHOOL

Course Desired	Junior High	Comp. Jr/Sr High	Voc-Tech High	Total
Darkroom techniques	0	3	0	3
Basic paper information	0	1	0	1
Camera special effects	0	1	0	1
Offset printing (Gen.)	3	3	0	6
Paste up and stripping	0	2	0	2
Screen printing	3	2	0	5
Innovative teaching--junior high graphic arts	1	0	0	1
Graphic arts projects	1	0	0	1
Work experience courses	1	0	0	1
Photography	4	2	1	7
Cinematography & audio-visual production	0	1	0	1
Vocational counseling	0	0	1	1
New graphic arts technology	0	0	1	1
Workshops in graphic arts	2	0	0	2
Short courses in fundamental gr. arts	1	0	0	1
Anything recommended by supervisor	0	0	1	1
Layout and design	0	3	0	3
Maintenance of equipment	0	1	0	1
Administration of resource library	0	1	0	1
Color photography	0	1	0	1
Color printing	0	1	0	1
Lighting	0	1	0	1
Graphic arts teaching methods	0	1	0	1
Bookbinding	0	1	0	1
Courses required for vocational certification	0	0	1	1
Preparing graphic arts course outlines	0	0	1	1
Process color	0	1	0	1
Presswork	0	2	0	2
Phototypesetting	0	1	0	1
Anything in graphic arts & photography	0	1	2	3
Estimating	0	1	0	1
Metrics in printing	0	1	0	1
Commercial art	0	0	1	1
Courses leading to associate degree in graphic arts	0	0	1	1
Total Courses:	16	32	10	58
Responding Teachers:	11	15	8	34
No Response:	7	12	1	20

Table 28

DISTRIBUTION OF SCHOOLS BY NUMBERS OF GRAPHIC ARTS COURSES
AND BY TYPE OF SCHOOL

Number of Different Graphic Arts Courses	Junior High			Comp. Jr/Sr High			Voc-Tech High			Total		
	# Sch.	% Sch.	# Crs.	# Sch.	% Sch.	# Crs.	# Sch.	% Sch.	# Crs.	# Sch.	% Sch.	# Crs.
4	0	0.0	0	0	0.0	0	1	2.4	4	1	2.4	4
3	0	0.0	0	4	9.5	12	0	0.0	0	4	9.5	12
2	2	4.8	4	9	21.4	18	0	0.0	0	11	26.2	22
1	10	23.8	10	8	19.1	8	8	19.0	8	26	61.9	26
Totals	12	28.6	14	21	50.0	38	9	21.4	12	42	100.0	64

In order to further describe the scope of graphic arts offerings in the secondary schools of Missouri, each respondent was asked the number of sections scheduled for each of the sixty-four courses. The responses of the schools are described in Table 29.

The mean number of sections for the fourteen courses offered in the junior high was 4.78 sections. Nearly all junior high schools offered from three to seven sections of their graphic arts courses. Exceptions were one junior high which offered twelve sections of one course and one which offered only one section.

The mean number of sections for the thirty-eight courses offered in the comprehensive junior-senior high was only 1.50. More than half of the courses (22 of 38) in these schools involved only one section. The vocational-technical schools scheduled a mean of 2.50 sections for their twelve courses. Ten of these courses involved the two-year course typically scheduled in the vocational setting. This usually included two sections of the course--each scheduled for a half day. The overall mean number of sections for all graphic arts classes in Missouri was 2.41 sections.

Table 29

DISTRIBUTION OF COURSES IN GRAPHIC ARTS BY NUMBER OF SECTIONS PER COURSE AND BY TYPE OF SCHOOL

No. of Sections Per Course	Junior High	Comp. Jr/Sr High	Voc-Tech High	Total
12	1	0	0	1
7	1	0	1	2
6	1	0	0	1
5	4	1	0	5
4	3	1	0	4
3	3	2	1	6
2	0	10	10	20
1	1	22	0	23
Not designated	0	2	0	2
Total Courses	14	38	12	64
Mean No. of Sections/Course	4.78	1.50	2.50	2.41

The total number of sections of graphic arts offered per school ranged from one to fourteen sections. The mean number of sections of graphic arts per school was 5.58 for the junior high schools, 2.71 for the comprehensive junior/senior high, and 3.33 for the vocational-technical schools. The overall mean number of graphic arts sections scheduled for the forty-two schools reported in the study was 3.67 sections. Table 30 describes these findings.

Table 30

DISTRIBUTION OF SCHOOLS BY TOTAL SECTIONS OF GRAPHIC ARTS OFFERED AND BY TYPE OF SCHOOL

Graphic Arts Sections Per School	Junior High	Comp. Jr/Sr High	Voc-Tech High	Total
14	0	0	1	1
12	2	0	0	2
9	0	1	0	1
8	1	0	0	1
6	1	0	0	1
5	3	2*	0	5*
4	1	3	0	4
3	3	4	0	7
2	0	5	8	13
1	1	6	0	7
Total Number of Schools	12	21	9	42
Mean Sections Per School	5.58	2.71	3.33	3.67

*One school had at least 5 Sections based upon incomplete data.

Number of Clock Hours of Instruction. Table 31 shows that the total number of hours of instruction in graphic arts per academic year varied from one clock hour to six hundred clock hours. In the junior high

Table 31

DISTRIBUTION OF COURSES IN GRAPHIC ARTS BY TOTAL CLOCK HOURS OF CLASS TIME AND TYPE OF SCHOOL

Clock Hours of Class Time	Junior High	Comp. Jr/Sr High	Voc-Tech High	Total
541-630	0	0	1	1
451-540	0	1	5	6
361-450	0	2	4	6
181-360	0	2	1	3
91-180	0	15	1	16
51-90	1	11	0	12
26-50	2	2	0	4
11-25	8	3	0	11
1-10	3	1	0	4
Not Designated	0	1	0	1
Total Number of Courses	14	38	12	64
Mean Clock Hours Per Course	26.14	157.03	467.83	187.14

schools the mean number of hours of instruction in graphic arts was 26.14 hours with no school reporting more than ninety hours. Hence, it appears that the typical junior high graphic arts instructional program would be about three days per week for one academic quarter.

The amount of instruction in the comprehensive junior-senior high school was quite varied; however, the mean was 157.03 hours. This would be somewhat less than the 180 hours scheduled for a class meeting one hour daily for one academic year. Twenty-six of the thirty-eight courses, or about two-thirds of the courses in the comprehensive high schools, meet for 51 to 180 class hours. The exceptions were quite likely junior high school offerings (50 hours or less) or vocational offerings (over 180 hours) within the comprehensive junior-senior high school organization.

The instruction in the vocational-technical schools ranged from 180 to 600 clock hours per year; i.e., from one hour to more than three hours of instruction per day. The mean of 467.83 hours of graphic arts instruction in the vocational programs shows that the typical program involves from two and one-half to three hours of daily instruction. The overall mean number of hours of instruction in graphic arts for all of Missouri is 187.14 hours or the equivalent of the classroom instruction required for approximately one unit of high school credit.

Number of Students. A total of 3612 students were being served by the sixty courses for which enrollments were reported in Missouri. This is a mean of 60.20 students served per course and when the mean number of sections per course is considered, each section would have a mean enrollment of 24.98 students. (See Table 29 and Table 32.)

As might be expected, the mean enrollment for junior high school graphic arts courses was highest with means of 152.86 students per course and 31.91 students per section. Eight of the fourteen courses served from 101 to 200 junior/senior high school students. One junior high course served more than three hundred students and none served fewer than twenty-six. Courses in the comprehensive junior-senior high school had mean enrollments of 32.29 students per course and 21.52 students per section, while the vocational-technical graphic arts courses had mean enrollments of 33.55 students per course and 13.42 students per section. Twenty-two of the thirty-eight courses in the comprehensive schools served from eleven to twenty-five students. Seven of the nine vocational schools served from twenty-six to fifty students and none served more than 100 total students.

Table 32

DISTRIBUTION OF GRAPHIC ARTS COURSES BY NUMBER OF STUDENTS ENROLLED AND TYPE OF SCHOOL

Students Enrolled Per Course	Junior High	Comp. Jr/Sr High	Voc-Tech High	Total
301-400	1	0	0	1
201-300	1	0	0	1
101-200	8	2	0	10
51-100	3	3	1	7
26-50	1	5	7	13
11-25	0	22	3	25
1-10	0	3	0	3
Not Designated	0	3	1	4
Total Number of Courses	14	38	12	64
Total Number of Students	2140	1130	369	3612
Mean Number of Total Students Served Per Course	152.86	32.29	33.55	60.20
Mean Number of Students Per Section	31.91	21.52	13.42	24.98

Grades Served. At the junior high school level, serving grades seven through nine, ten of the fourteen courses included students in grade eight; however, five different grades or combination of grades were included in the responses. The grade levels served by the graphic arts courses in Missouri are identified in Table 33.

Table 33

DISTRIBUTION OF GRAPHIC ARTS COURSES BY COMBINATIONS OF GRADE LEVELS AND TYPE OF SCHOOL

Grade Combinations	Junior High	Comp. Jr/Sr High	Voc-Tech High	Total
Grade 7	3	0	0	3
Grades 7 and 8	3	1	0	4
Grade 8	6	0	0	6
Grades 8 and 9	1	0	0	1
Grades 8 thru 12	0	1	0	1
Grade 9	1	0	1	2
Grades 9 and 10	0	1	0	1
Grades 9 thru 11	0	1	0	1
Grades 9 thru 12	0	7	0	7
Grades 10 and 11	0	1	0	1
Grades 10 thru 12	0	10	2	12
Grades 11 and 12	0	14	8	22
Grades 11 thru adult	0	0	1	1
Grade 12	0	1	0	1
No response	0	1	0	1
Total Courses	14	38	12	64

In the comprehensive school, graphic arts enrollments were included from grades seven through twelve in nine combinations of grade levels or single grades. Of the thirty-seven courses reported for this type of school, fourteen included students in combined grades eleven and twelve, while ten others included grades ten through twelve, and an additional seven included grades nine through twelve. Heaviest enrollments in these schools appeared to be in grades eleven and twelve.

The vocational-technical school enrollments were likewise predominately in grades eleven and twelve. One course of a pre-vocational nature was for students in grade nine only and two others allowed for students in grade ten along with the eleventh and twelfth graders.

Course Titles. A total of thirty-three different titles were reported for the sixty-four graphic arts courses reported in Missouri. The titles of General Shop and Graphic Arts were reported most often, with their respective frequencies of ten and nine courses. Photography was a course title of six courses and Printing the title of four courses. Graphic Arts I and II and Journalism were titles reported three times. Course titles reported twice were Basic Graphic Arts and Offset I. Twenty-five other titles were each reported for one course. A complete listing of course titles is shown in Table 34.

In the junior high schools course titles related to General Shop or General Industrial Arts were reported for ten of the fourteen courses. The remaining four courses had titles of Printing or Graphic Arts.

In the comprehensive junior-senior high schools, Photography was listed for six course titles and General Shop for four titles. Titles reported three times in the comprehensive schools were Graphic Arts & Journalism, while Printing and Offset I were mentioned twice. Seventeen other titles were each listed once for comprehensive schools.

In the vocational-technical schools the titles of Graphic Arts or Graphic Arts I and II were used for seven of the twelve courses reported. Five other titles were reported one time each.

Table 34

DISTRIBUTION OF COURSES IN GRAPHIC ARTS BY COURSE TITLE AND BY TYPE OF SCHOOL

Title of Course	Junior High	Comp. Jr/Sr High	Voc-Tech High	Total
General Shop	6	4	0	10
Graphic Arts	2	3	4	9
Photography	0	6	0	6
Printing	1	2	1	4
Graphic Arts I and II	0	0	3	3
Journalism	0	3	0	3
Basic Graphic Arts	0	1	1	2
Offset I	0	2	0	2
General Shop-Printing	1	0	0	1
General Shop-Bookcrafts	1	0	0	1
General Industrial Arts	1	0	0	1
Introd. to Graphic Arts	1	0	0	1
Industrial Arts II	1	0	0	1
General Printing	0	1	0	1
Graphic Communication	0	1	0	1
Industrial Crafts	0	1	0	1
Printing I and II	0	1	0	1
Pre-Vocational GA	0	1	0	1
Industrial Arts Printing 1-2	0	1	0	1
Industrial Arts Printing 3-8	0	1	0	1
Graphic Arts II	0	1	0	1
Offset II	0	1	0	1
Production Printing	0	1	0	1
Repro Graphics	0	1	0	1
Advanced Printing	0	1	0	1
Screen Printing	0	1	0	1
Crafts	0	1	0	1
Publications	0	1	0	1
Office Practice	0	1	0	1
Business Machines	0	1	0	1
Composition	0	0	1	1
Camera and Offset	0	0	1	1
Letterpress	0	0	1	1
Total Courses	14	38	12	64

Curricular Changes. Table 35 indicates the curricular changes in graphic arts which occurred during the 1973-74 and 1974-75 school years.

Table 35

DISTRIBUTION OF SCHOOLS REPORTING SELECTED CHANGES IN THE GRAPHIC ARTS CURRICULUM DURING PAST TWO YEARS BY TYPE OF SCHOOL

	Junior High (N=12)		Comp. Jr/Sr High (N=21)		Voc-Tech High (N=9)		Total (N=42)	
Type of Curricular Change	#	%**	#	%**	#	%**	#	%**
No Change	2	16.7	5	23.8	1	11.1	8	19.0
Began Instruction in GA	5	41.7	7	33.3	1	11.1	13	31.0
New Courses Added	1	8.3	4	19.0	1	11.1	6	14.3
Courses Deleted	0	0	2	9.5	1	11.1	3	7.1
Content Within Courses Changed	5	41.7	8	38.1	4	44.4	17	40.5
Other	0	0	2	9.5	1	11.1	3	7.1
Total Schools	13*		28*		9*		51*	

*Each school may have indicated more than one type of curricular change.

**Percentages for each type of school were based on responding schools of that type; percentages of total were based on all responding schools.

This table shows that between ten and twenty-five percent of each type of school included in the study made no curricular changes during this period. In the most static type of school, nearly one of every four comprehensive junior-senior highs (23.8 percent) reported no curricular changes.

Nearly one-third (31.0 percent) of all schools offering instruction in graphic arts began that instruction during the two years preceding this study. While only one vocational school (11.1 percent) initiated graphic arts instruction between 1973 and 1975, seven comprehensive junior-senior high schools (33.3 percent) and five junior high schools (41.7 percent) began graphic arts instruction during that two-year period.

Although Table 35 indicates that several schools in each category added or deleted graphic arts courses during the designated two years, a larger number changed the curriculum through revision of content within their courses. Approximately forty percent of each type of school accomplished course content revision between 1973 and 1975.

Appendix E shows the specific changes made in the graphic arts curriculum between 1973 and 1975.

Among curriculum changes proposed for the school years of 1975-76 and 1976-77, eight schools (19 percent) of the total of forty-two responding in this portion of the study proposed to add more areas of graphic arts within their present courses. One of every three junior high schools planned to make this type of curricular addition. Approximately ten percent of each type of school planned to add advanced level courses in graphic arts by the end of the 1976-77 academic year. Table 36 shows all curricular changes planned for the two-year period following this study.

Table 36

DISTRIBUTION OF SCHOOLS REPORTING PROPOSED CHANGES IN THE GRAPHIC ARTS CURRICULUM DURING NEXT TWO YEARS BY TYPE OF SCHOOL

Curricular Change	Junior High (N=12)		Comp. Jr/Sr High (N=21)		Voc-Tech High (N=9)		Total (N=42)	
	#	%*	#	%*	#	%*	#	%**
Add more areas of graphic arts	4	33.3	2	9.5	2	22.2	8	19.0
Add advanced level courses	1	8.3	2	9.5	1	11.1	4	9.5
Add independent study and individualized instruction	0	0.0	1	4.8	1	11.1	2	4.8
Add layout, presentation & lettering	0	0.0	2	9.5	0	0.0	2	4.8
Add mass production	1	8.3	0	0.0	0	0.0	1	2.4
Go from semester to year course	0	0.0	1	4.8	0	0.0	1	2.4
Add more sections of present courses	0	0.0	1	4.8	0	0.0	1	2.4

*Percentages were based on schools of that type.

**Percentages were based on all schools.

Only four schools predicted a need for additional graphic arts instructors during the period from 1975 to 1977. No school indicated the need for more than one new instructor. Three of the schools with the proposed increase in staff were comprehensive junior-senior high schools while the remaining staff increase was proposed for a vocational-technical school. The lack of stated future need for additional graphic arts staff at the junior high school level seemed inconsistent with the addition of graphic arts instruction for the first time in five of the twelve reporting junior high schools during the two years preceding the study.

Production Activities. The relationship between instruction and production is usually a significant aspect of the secondary school graphic arts program, especially in most vocational-technical schools. It may be significant to note that three of the nine vocational schools failed to respond to this section of the survey. While all of the vocational-technical instructors who responded indicated some type of duties related to production printing, instructors in over half (58.3 percent) of the twelve junior high and in one-third (33.3 percent) of the twenty-one comprehensive junior-senior high graphic arts programs in the study indicated their responsibilities involved instruction only. Instructors from one-fourth to one-third of each type of school were responsible for "production and instruction combined daily". In addition, some instructors in all three categories of schools said they had responsibilities for "instruction, plus supervision of production performed by advanced students as appropriate class activities". Table 37 shows the above data in addition to other less frequent responses to the production-instruction relationship.

Table 38 shows a further breakdown by percent of instructor time devoted to production work in the secondary school graphic arts laboratories. In agreement with Table 37, 33.3 percent of the respondents reported that they did no production work, but were only responsible for graphic arts instruction. Seven of these were in junior high schools. Only one of the junior high school instructors spent more than

Table 37

DISTRIBUTION OF SCHOOLS WITH GRAPHIC ARTS BY RESPONSIBILITY OF GRAPHIC ARTS INSTRUCTOR FOR INSTRUCTION/PRODUCTION ACTIVITIES AND BY TYPE OF SCHOOL

Instruction/Production Relationship	Junior High (N=12)		Comp. Jr/Sr High (N=21)		Voc-Tech High (N=9)		Total (N=42)	
	#	%	#	%	#	%	#	%
Instruction Only	7	58.3	7	33.3	0	0.0	14	33.3
Production and Instruction Combined Daily	3	25.0	6	28.6	3	33.3	12	28.6
Instruction and Supervise paid students	0	0.0	1	4.8	0	0.0	1	2.4
Instruction and Supervise students-advanced class activities	2	16.7	2	9.5	2	22.2	6	14.3
Other--Prod. and Supervision of student production	0	0.0	1	4.8	0	0.0	1	2.4
Other--Instruction and Production daily plus full-time production in summers	0	0.0	2	9.5	1	11.1	3	7.1
No response	0	0.0	2	9.5	3	33.3	5	11.9
Totals	12	100.0	21	100.0	9	100.0*	42	100.0

*Sum of column may not total 100 percent due to rounding.

Table 38

DISTRIBUTION OF SCHOOLS WITH GRAPHIC ARTS BY AMOUNT OF GRAPHIC ARTS INSTRUCTOR'S TIME DEVOTED TO PRODUCTION ACTIVITIES AND BY TYPE OF SCHOOL

Percentage Quantile	Junior High (N=12)		Comp. Jr/Sr High (N=21)		Voc-Tech High (N=9)		Total (N=42)	
	#	%	#	%	#	%	#	%
76-100%	0	0.0	0	0.0	1	11.1	1	2.4
51-75%	0	0.0	2	9.5	3	33.3	5	11.9
26-50%	1	8.3	3	14.3	4	44.4	8	19.1
Up to 25%	4	33.3	10	47.6	0	0.0	14	33.3
None	7	58.3	6	28.6	1	11.1	14	33.3
Totals	12	100.0*	21	100.0	9	100.0*	42	100.0

*Sum of column may not total 100 percent due to rounding.

twenty-five percent of his time on production. Ten of the fifteen comprehensive school instructors had production responsibilities which accounted for less than 25 percent of their time. The other five spend from one-fourth to three-fourths of their time on production activities. Seven of the nine vocational school instructors spent a like amount of their time on production activities.

The effect of production work in the graphic arts laboratory upon the instruction has in the past been a topic of strong and differing opinions in many schools. As shown in Table 39 the present study found only about ten percent (4 responses) of the forty-two respondents to have a negative opinion about the effect of production activities.

Table 39

DISTRIBUTION OF SCHOOLS WITH GRAPHIC ARTS BY OPINIONS ON THE EFFECT OF PRODUCTION WORK IN GRAPHIC ARTS LABORATORY ON INSTRUCTION AND BY TYPE OF SCHOOL

Opinion of Effect of Production Work on Instruction	Junior High		Comp. Jr/Sr High		Voc-Tech High		Total	
	#	%	#	%	#	%	#	%
Significant Positive	1	8.3	7	33.3	5	55.6	13	31.0
Some Positive	1	8.3	2	9.5	3	33.3	6	14.3
Little either way	3	25.0	0	0.0	0	0.0	3	7.1
Some Hindrance	0	0.0	2	9.5	1	11.1	3	7.1
Great Hindrance	0	0.0	1	4.8	0	0.0	1	2.4
Occasional Production Job Only	0	0.0	1	4.8	0	0.0	1	2.4
No Response	7	58.3	8	38.1	0	0.0	15	35.7
Totals	12	100.0	21	100.0	9	100.0	42	100.0

Apparently many of the fourteen schools with no production graphic arts responsibilities had no opinion regarding the desirability of graphic arts production activities, since fifteen schools gave no response to this section of the survey. None of the junior high teachers with production responsibilities recorded negative reactions to these activities. Instructors of ten of the thirteen comprehensive schools in the study said that production work was of "some aid" or "significant aid" to instruction. The remaining three schools of this type felt production work was "some hindrance" or "great hindrance" to instruction. Eight of the nine vocational-technical schools thought of production as an "aid" to instruction; the other saw production as a "hindrance" to instruction. The "aid" opinions in this survey greatly outnumbered the "hindrance" opinions in all types of schools.

Table 40 was prepared to identify the types of production jobs done in graphic arts laboratories in Missouri. Of the forty-two schools responding to this section, only twenty-eight were involved in production activities. This table shows that four types of activities were accomplished in at least nineteen of these schools with the frequency as shown: (1) printing programs, tickets, and posters--23 schools; (2) printing administrative forms--21 schools; (3) printing work for other instructors--20 schools; and (4) printing pamphlets, brochures, and booklets--19 schools.

More than two-thirds of the comprehensive and vocational schools were responsible for these four types of production activities. Although the percentage of the junior high schools doing them was much lower than in the other types of schools, each of these four categories of printing was also done in some junior high schools.

Six and seven comprehensive junior-senior high schools indicated that they did production photography for the school yearbook and school newspaper respectively. This number seems directly related to the six schools of that type which were reported in Table 34 as having photography courses. Six "other" categories of production work each written in by one school are shown in Table 40.

The production activities of the secondary school graphic arts laboratories were further delineated by production processes and are shown in Table 41. Again the reader is reminded that only twenty-eight of the forty-two responding schools were doing production work of any

Table 40

DISTRIBUTION OF SCHOOLS BY SPECIFIC PRODUCTION JOBS IN GRAPHIC ARTS LABORATORIES AND BY TYPE OF SCHOOL

Production Category	Junior High	Comp. Jr/Sr High	Voc-Tech High	Total
Print programs, tickets, posters	2	12	9	23
Print administration forms	1	11	9	21
Print work for other instructors	2	10	8	20
Print pamphlets, brochures, booklets	1	10	8	19
Print school paper	0	7	3	10
Photography for school paper	0	7	0	7
Photography for school yearbook	0	6	0	6
Print school yearbook	0	0	1	1
Others:	3	1	2	6
Commercial and publication printing	0	0	1	1
Hot stamp awards	1	0	0	1
Pictures and shirts	1	0	0	1
School periodicals for supt.	0	0	1	1
Cartoons and illustrations for publ.	0	1	0	1
Bumper stickers	1	0	0	1
Total Schools Doing Production	5	14	9	28
Total Schools Responding	12	21	9	42

Table 41

DISTRIBUTION OF SCHOOLS ACCOMPLISHING VARIOUS GRAPHIC ARTS PROCESSES IN THEIR PRODUCTION LABORATORY BY TYPE OF SCHOOL

Graphic Arts Process	Junior High	Comp. Jr/Sr High	Voc-Tech High	Total
Design and Layout	4	13	9	26
Image Generation (Set Copy)	2	11	9	22
Image Assembly (Pasteup or Imposition)	2	10	9	21
Image Carrier Preparation (Platemaking, Adhering Stencils)	3	11	9	23
Image Transfer:Offset Printing	1	11	9	21
Image Transfer:Letterpress Printing	2	6	7	15
Image Transfer:Screen Printing	4	7	0	11
Image Transfer:Stencil (Mimeograph) Printing	1	2	0	3
Image Transfer:Hot Stamp Printing	2	1	1	4
Binding and Finishing (Trimming, Collating, Stitching, Padding, Drilling, Perforating, etc.)	0	9	9	18
Other: Black/White Color Photo - Dot Etch - and Color Correction	0	0	1	1
Total Schools Doing Production Work	5	14	9	28
Total Schools Responding	12	21	9	42

type. Seven processes were accomplished in more than half of these twenty-eight laboratories in the frequency shown: (1) Design and Layout --26 schools; (2) Image Generation--22 schools; (3) Image Assembly--21 schools; (4) Image Carrier Preparation--23 schools; (5) Image Transfer: Offset Printing--21 schools; (6) Image Transfer: Letterpress Printing--15 schools; and (7) Binding and Finishing--18 schools. Of these, only letterpress printing was not done by all vocational schools and at least nine of the fourteen comprehensive schools doing production work.

One rather unique finding showed that while four of the five junior high schools with production and half of the fourteen comprehensive schools with production did image transfer using stencil printing, none of the vocational schools used this process.

A final question related to production work was, "Do you recommend the use of production jobs as learning experiences for your students?" Table 42 shows that ten schools (23.8 percent) responded "positively yes", thirty schools (71.4 percent) responded "in some instances, yes", and two (4.8 percent) responded "positively no". All junior high schools responded in the middle category. Both of the "no" responses were from the comprehensive school category. Again the vocational schools were most positive about the value of production jobs for student learning.

Graphic Arts Equipment. The graphic arts equipment found in the graphic arts laboratory of the secondary schools of Missouri is reported in Table 43. The only item specifically listed on the information form but found in no reporting school laboratory was the auto-fed, power screen press. Other items were found in from one to twenty-two laboratories. For nearly all items listed on the information form the mean quantity per school with that item ranged from 1.00 to 2.00.

Table 42

DISTRIBUTION OF RECOMMENDATIONS OF SCHOOLS TOWARD USE OF GRAPHIC ARTS PRODUCTION JOBS AS LEARNING EXPERIENCES FOR STUDENTS BY TYPE OF SCHOOL

Response	Junior High		Comp. Jr/Sr High		Voc-Tech High		Total	
	#	%	#	%	#	%	#	%
Positively Yes	0	0.0	6	28.6	4	44.4	10	23.8
In Some Instances Yes	12	100.0	13	61.9	5	55.6	30	71.4
Positively No	0	0.0	2	9.5	0	0.0	2	4.8
Total Responses	12	100.0	21	100.0	9	100.0	42	100.0

Exceptions were type banks with foundry type which had a mean quantity of 11.72 banks, strike-on text systems with a mean of 2.13 units, offset presses or duplicators with a mean of 2.06 units, light tables with a mean of 4.81 tables, and monotype units where the lone school with this unit failed to indicate the quantity.

Perhaps the number of schools with each piece of equipment shown in Table 43 is more important than the mean number of units per responding school. Of the twelve junior high schools, saven schools reported type banks with foundry type; five schools had hand-operated platen presses and manual paper cutters; four schools each had imposition stones and hot stamping presses; three schools indicated proof presses; two each had offset duplicators or presses and screen process drying racks; and one had a contact printer or contact frame, a hand-fed power platen press, an auto-fed power platen press, a hand-fed power screen press, a monotype

Table 43

DISTRIBUTION OF SCHOOLS WITH ITEMS OF GRAPHIC ARTS EQUIPMENT BY TYPE OF SCHOOL

Equipment Item	Junior High (N=12)		Comp. Jr/Sr High (N=21)		Voc-Tech High (N=9)		Total (N=42)	
	No.	Mean/School	No.	Mean/School	No.	Mean/School	No.	Mean/School
Type banks and foundry type	7	20.17	6	6.83	5	9.80	18	11.72
Imposition stones	4	1.67	5	1.80	8	1.00	17	1.43
Strike-on text system	0	0.00	5	2.20	5	1.50	10	2.13
Computerized phototypesetter	0	0.00	2	1.00	5	1.00	7	1.00
Non-computerized phototypesetter	0	0.00	8	1.38	5	1.25	13	1.33
Tape perforator	0	0.00	1	1.00	3	1.50	4	1.33
Vertical process camera	0	0.00	4	1.25	2	1.00	6	1.20
Horizontal process camera	0	0.00	5	1.00	8	1.20	13	1.10
Temperature control sink	0	0.00	5	1.00	6	1.50	11	1.25
Contact printer or contact frame	1	1.00	8	1.17	6	1.50	15	1.27
Offset press or duplicator (up to 14x20)	2	1.00	11	1.80	9	2.57	22	2.06
Offset press (14x20 or larger)	0	0.00	1	1.00	8	1.16	9	1.14
Hand operated platen press (pilot)	5	1.50	3	2.33	4	1.00	12	1.67
Hand-fed power platen press	1	1.00	6	1.33	4	1.00	11	1.20
Auto-fed power platen press	1	1.00	0	0.00	5	1.00	6	1.00
Auto-fed power cylinder press	0	0.00	1	1.00	1	*	2	1.00
Proof press	3	1.00	4	1.00	6	1.25	13	1.10
Hot stamping press	4	1.33	1	1.00	1	*	6	1.25
Hand-fed power screen press	1	*	2	1.00	0	0.00	3	1.00
Auto-fed power screen press	0	0.00	0	0.00	0	0.00	-	-
Drying rack	2	1.00	3	1.00	1	5.00	6	1.80
Linotype	0	0.00	1	2.00	3	1.67	4	1.75
Monotype	1	*	0	0.00	0	0.00	1	*

Table 43 (Continued)

Equipment Item	Junior High (N=12)		Comp. Jr/Sr High (N=21)		Voc-Tech High (N=9)		Total (N=42)	
	No.	Mean/School	No.	Mean/School	No.	Mean/School	No.	Mean/School
Ludlow	0	0.00	0	0.00	1	2.00	1	2.00
Power miter saw	0	0.00	1	1.00	5	1.00	6	1.00
Plate maker (exposure unit)	0	0.00	11	1.10	9	1.25	20	1.17
Light tables	1	9.00	11	3.00	9	6.56	21	4.81
Precision line-up table	0	0.00	2	1.50	5	1.50	7	1.50
Folder	0	0.00	7	1.29	8	1.14	15	1.21
Collator	0	0.00	3	1.33	1	1.00	4	1.25
Stitcher	0	0.00	5	1.00	8	1.29	13	1.17
Paper drill	0	0.00	5	1.00	8	1.25	13	1.15
Manual paper cutter	5	1.33	11	1.22	1	1.00	17	1.23
Power paper cutter	0	0.00	4	1.00	9	1.25	13	1.17
Other Equipment: (written in)								
Black/White Photo Darkroom	0		1		0		1	
Cameras	0		2		0		2	
Screen Printing Frames	3		3		0		6	
Mimeo and/or Spirit Duplicators	0		1		0		1	
Electrostatic Copier	1		0		0		1	
Dot Etching Table	0		0		1		1	
Enlarger	0		2		1		3	
Densitometer	0		0		1		1	
Jogger	0		2		0		2	
Sign Press	1		0		0		1	
Plastic Binding Unit	0		1		0		1	
Casting Box	0		1		0		1	
Plate Sink	0		2		0		2	
Screen Sink with Pump	0		1		0		1	

Table 43 (Continued)

Equipment Item	Junior High (N=12)		Comp. Jr/Sr High (N=21)		Voc-Tech High (N=9)		Total (N=42)	
	No.	Mean/School	No.	Mean/School	No.	Mean/School	No.	Mean/School
Plate Developing Table	0		0		1		1	
Camera Unit Light Control	0		0		1		1	
Waxer	0		1		0		1	
PMT Processor	0		1		0		1	
Hand-Operated Screen Press	1		0		0		1	
Stapler	0		0		1		1	

*The quantity of each item was omitted on a few responses.

Means were calculated using only responses in which the quantity was reported. Schools not having a specific item were not included in calculating the mean. If all respondents failed to report the quantity, the mean was necessarily omitted.

unit, and light tables. Four junior high schools also wrote in screen printing frames or presses. Offset printing equipment was conspicuously absent from the junior high school graphic arts equipment.

While at least one of the twenty-one responding comprehensive junior-senior high schools had each piece of equipment except the auto-fed power platen press, the monotype unit, and the Ludlow unit (in addition to the auto-fed power screen press reported earlier), only four items were reported by more than half of those schools. Eleven schools had an offset press or duplicator, a plate maker, some light tables, and a manual paper cutter. In addition, at least five schools had the following pieces of equipment: non-computerized phototypesetter and contact printer or frame--8 schools each; folder--7 schools; type banks with foundry type and hand-fed power platen press--6 schools each; and imposition stones, strike-on text system, horizontal process camera, temperature control sink, stitcher, and paper drill--5 schools each. The list of equipment indicates that more comprehensive schools are getting offset printing equipment; however, most of the schools of this type lacked even the basic offset equipment and few had the diversity of equipment to include more than one major image transfer process.

In the vocational-technical schools all nine reporting schools had these pieces of equipment: offset press or duplicator, plate maker, light tables, and power paper cutter. Eight of the nine schools reported having imposition stones, horizontal process cameras, offset presses (14 x 20 or larger), folders, stitchers, and paper drills. More than half of the vocational schools had several other pieces of basic equipment related to either relief or planographic printing processes. Write-in responses of "other" equipment are included near the end of Table 43.

In examining the reported changes in secondary schools graphic arts equipment between 1973 and 1975, the reader is directed to Table 44. Perhaps the most significant responses were the three comprehensive junior-senior high schools which added the "entire graphic arts equipment layout" during these two years. Six schools added silk screen equipment, five schools added text typesetters, four schools purchased folders, and three added offset duplicators. While the addition of silk screen equipment was not a major financial investment, in several schools it represented a first attempt at adding graphic arts to a general industrial art course and may have represented a major breakthrough in graphic arts instruction in the schools affected. Twenty other items of equipment were added by one or two schools each.

The forty-two reporting schools reported that a total of only six major pieces of equipment were deleted from the inventories between 1973 and 1975. Furthermore, no school indicated that equipment was updated with equipment trades. Linotype machines were deleted in two vocational programs. No other piece of equipment was listed more than once. Table 44 also provides a complete listing of equipment deletions.

When a dollar value of the graphic arts equipment added between 1973 and 1975 was studied, it was found that exactly half of the forty-two schools spent no money for graphic arts. This is described in Table 45. Another nine spent less than $1000 annually during the biennium. No junior high school reported more than a $5000 expenditure. Comprehensive schools likewise spent less than $5000, except for two which spent between $50,000 to $100,000, apparently in setting up new facilities. Of the six vocational schools reporting equipment expenditures, one spent between $1000 and $5000, two added between $5000 and $10,000 worth of

Table 44

DISTRIBUTION OF SCHOOLS WITH EQUIPMENT CHANGES IN GRAPHIC ARTS LABORATORIES IN PREVIOUS TWO YEARS BY TYPE OF SCHOOL

Item of Equipment	Junior High (N=12)	Comp. Jr/Sr High (N=21)	Voc-Tech High (N=9)	Total (N=42)
Added				
Offset Duplicator	1	2	0	3
Electrostatic Copier	1	0	0	1
Display Typesetter	0	0	1	1
Black/White Photo Lab	0	1	0	1
Enlarger	0	1	1	2
Offset Press	0	0	2	2
Text Typesetter	0	0	5	5
Paper Cutter	1	0	0	1
Silk Screen Equipment	3	3	0	6
Foundry Type	2	0	0	2
Cameras	0	1	0	1
Entire G.A. Equip. Layout	0	3	0	3
Spirit Duplicator	1	0	0	1
Press Attachments	0	0	1	1
Folder	0	2	2	4
Light Tables	0	1	0	1
Vacuum Frames	0	1	0	1
Other Photography Equipment	0	1	0	1
Platen Press	1	0	0	1
Jogger	0	1	0	1
Waxer	0	1	0	1
PMT Processor	0	1	0	1
IBM Selectric II Typewriter	0	1	0	1
Platemaker	0	1	0	1
Hot Stamp Press	1	0	0	1
Layout Tables	0	0	1	1
Film Dryer	0	0	1	1
Deleted				
Linotype	0	0	2	2
IBM MTST	0	0	1	1
Hand Composition	0	0	1	1
Cylinder Presses	0	0	1	1
Varityper	0	1	0	1

Table 45

DISTRIBUTION OF SCHOOLS EXPENDING MONEY FOR ADDITIONAL EQUIPMENT DURING PREVIOUS TWO YEARS BY TYPE OF SCHOOL AND AMOUNT OF EXPENDITURE

Amount of Expenditure	Junior High	Comp. Jr/Sr High	Voc-Tech High	Total
Over $100,000	0	0	0	0
50,000 - 99,999	0	2	0	2
30,000 - 49,999	0	0	1	1
20,000 - 29,999	0	0	0	0
10,000 - 19,999	0	0	2	2
5,000 - 9,999	0	0	2	2
1,000 - 4,999	2	2	1	5
500 - 999	2	1	0	3
Less than $500	1	5	0	6
None	7	11	3	21
Total Schools	12	21	9	42

equipment, two expended between $10,000 and $20,000, and the final one added equipment valued between $30,000 and $50,000. It appears that the financing for graphic arts equipment from 1973 and 1975 was not very evenly distributed, since great variations in expenditures were reported.

The equipment changes planned for the 1975-1977 biennium are shown in Table 46. Only two items were scheduled for deletion--a Linotype machine by a vocational school and a hand-operated paper cutter by a comprehensive junior-senior high school.

Table 46

DISTRIBUTION OF SCHOOLS PLANNING EQUIPMENT CHANGES FOR GRAPHIC ARTS LABORATORIES DURING NEXT TWO YEARS BY TYPE OF SCHOOL

Item of Equipment	Junior High (N=12)	Comp. Jr/Sr High (N=21)	Voc-Tech High (N=9)	Total (N=42)
To Be Deleted				
Linotype	0	0	1	1
Hand-operated Paper Cutter	0	1	0	1
To Be Added				
Offset Duplicator or Press	1	3	2	6
Display or Text Typesetter	1	1	1	3
Sign Press	1	0	0	1
SLR Camera	0	1	0	1
Rapid Copy System	0	0	1	1
Paper Cutter	1	2	0	3
Silk Screen Equipment	2	0	0	2
Foundry Type	1	1	0	2
Cameras	0	1	0	1
Folder	0	1	1	2
Platen Press	3	0	0	3
Waxer	0	0	1	1
Enlarger	0	1	0	1
Camera/Plate System	0	0	1	1
Proofing Equipment	0	0	1	1
Humidifier	0	0	1	1
Other Photo Equipment	1	0	0	1
Color Enlarger	0	1	0	1
Master Maker	0	1	0	1
Web Press	0	0	1	1
Rubber Stamp Equipment	1	0	0	1
Contact Printer	0	1	0	1

The items most frequently mentioned for addition to the present equipment were offset duplicators or presses, which were being anticipated by six schools. Three schools were planning to add either text or display typesetting equipment, paper cutters, and platen presses. Of these items the offset presses, duplicators and typesetting equipment were being planned for all three types of schools; however, no paper cutters were planned for vocational schools and platen presses were only in the plans of junior high schools. The only other items receiving a frequency greater than one were folders, foundry type, and silk screen equipment--each were additions planned for two schools. Fifteen other items were listed each by one school.

When the amount of expenditure being planned for 1975 to 1977 was tabulated in Table 47, it was found that twenty-four of the forty-two schools planned no expenditure. Of the six junior high schools planning an expenditure for equipment, four were for less than $500 and the remaining two were from $500 to $5,000. Little pattern in planned expenditures prevailed among the comprehensive schools. Although two-thirds of these schools planned no equipment addition, three planned expenditures of less than $500 and one planned more than a $50,000 capital expenditure. The remaining three had plans between these two amounts. Among the nine vocational schools, four planned no additional equipment and four planned a $5,000 to $10,000 expenditure. The final vocational school hoped to spend more than $50,000 for new equipment.

Program Financing. The schools were asked to indicate the method used for financing the graphic arts program. Their responses are shown in Table 48. All schools agreed that the district paid for capital equipment; however, the methods of financing the graphic arts supplies involved three sources--production profits, student fees, and district funds.

Among the forty schools responding to this item, twenty indicated that their district paid for all supplies. Students paid for all supplies in thirteen other schools and production financed supplies for one school.

Table 47

DISTRIBUTION OF SCHOOLS PLANNING EXPENDITURES FOR GRAPHIC ARTS EQUIPMENT DURING NEXT TWO YEARS BY AMOUNT OF EXPENDITURE AND BY TYPE OF SCHOOL

Amount of Expenditure	Junior High	Comp. Jr/Sr High	Voc-Tech High	Total
Over $100,000	0	0	0	0
50,000 - 99,999	0	1	1	2
30,000 - 49,999	0	0	0	0
20,000 - 29,999	0	0	0	0
10,000 - 19,999	0	1	0	1
5,000 - 9,999	0	0	4	4
1,000 - 4,999	1	2	0	3
500 - 999	1	0	0	1
Less than $500	4	3	0	7
None	6	14	4	24
Totals	12	21	9	42

Table 48

DISTRIBUTION OF SCHOOLS BY METHOD OF FINANCING GRAPHIC ARTS ACTIVITIES AND BY TYPE OF SCHOOL

Method of Financing	Junior High		Comp. Jr/Sr High		Voc-Tech High		Total	
	#	%	#	%	#	%	#	%
Production Profits Finance Instructional Supplies and Capital Equipment	0	0.0	1	4.8	0	0.0	1	2.4
Students Pay for Supplies; District Pays for Capital Equipment	6	50.0	7	33.3	0	0.0	13	31.0
District Pays for Supplies and Capital Equipment	4	33.3	9	42.9	7	77.8	20	47.6
Students and District Share Supply Expenses; District Pays for Capital Equipment	1	8.3	2	9.5	0	0.0	3	7.1
Other: District and Profits Pay Supplies; District Pays for Capital Equipment	0	0.0	0	0.0	2	22.2	2	4.8
Other: District Pays Supplies, Student Reimburses if He Keeps Product	0	0.0	1	4.8	0	0.0	1	2.4
No Response	1	8.3	1	4.8	0	0.0	2	4.8
Totals	12	99.9*	21	100.1*	9	100.0	42	100.1*

*Totals not equal to 100 percent due to rounding.

Four schools reported a combination of student and district funds used for supplies and two schools reported a combination of district funds and production profits as the source fund for supplies.

In the junior high schools student fees paid for all or part of the supplies in seven of the eleven reporting schools. District funds were used for supplies at the remaining junior high schools. In comprehensive high schools, district funds were involved at least in part in twelve of the responding twenty schools; however, students fees were also involved in ten of these schools. Among the vocational schools, districts paid fees for supplies in all schools, although production profits were also included in two schools.

Although many of the schools did not respond to the inquiries regarding the annual budget provided by the school districts for graphic arts supplies and graphic arts equipment, Table 49 shows the distribution of the schools providing responses to the annual financing for supplies and for equipment. One must bear in mind when observing these budgets that previous tables showed that the junior high schools were reaching many more students than the other types of school, which the total cost of supplies should reflect. However, the amount of graphic arts instructional time per student was much less in the junior high school; thus the sophistication of the equipment needed for instruction is likely to involve less total expense.

As might be predicated from the results shown in Table 48, the vocational schools were provided better district support for supplies than the other types of schools; however, several of the other types of school received from $1,000 to $10,000 for supplies annually.

Since the number of students being provided instruction is not given here and the percentage of "no response" is high, it is difficult to assess the adequacy of the financing provided.

Table 49

DISTRIBUTION OF SCHOOLS BY AMOUNT OF ANNUAL FINANCING AND BY TYPE OF SCHOOL

Amount of Annual Financing	Junior High		Comp. Jr/Sr High		Voc-Tech High		Total	
	Supp.	Equip.	Supp.	Equip.	Supp.	Equip.	Supp.	Equip.
Over $20,000	0	0	0	0	0	0	0	0
10,000 - 19,999	0	1	0	0	0	0	0	1
5,000 - 9,999	1	0	0	0	2	1	3	1
2,000 - 4,999	0	0	3	0	3	1	6	1
1,000 - 1,999	1	1	1	0	0	0	2	1
500 - 999	0	1	2	2	1	0	3	3
200 - 499	2	1	3	2	0	0	5	3
100 - 199	1	1	1	0	0	0	2	1
Less than $100	0	0	2	2	0	0	2	2
No Response	7	7	9	15	3	7	19	29
Total Schools	12		21		9		42	

In examining the annual financing for graphic arts equipment, one may speculate that few schools have an annual plan or budget for equipment since most schools failed to respond to this item. In general, since the response was higher among this group of schools, the junior high schools appeared to know their annual budget for equipment or were more willing to disclose their budget than the other types of schools. Also, the reported budget for the comprehensive school seemed weakest since no comprehensive school reported an annual budget for equipment of more than $1,000. Again the low response rate provides inadequate data for a clear assessment of the budget for graphic arts equipment.

Program Strengths and Weaknesses. What are the characteristics of a strong graphic arts program? The schools were asked to list the three principal strengths of their graphic arts program. Thirty-four of the forty-two schools responded to this item and listed a total of eighty-four strengths as shown in Table 50. The strength mentioned most often--eighteen times--was related to the concept that the program provided broad,introductory experiences with career information in the graphic arts areas. Eleven of these respondents represented comprehensive schools and six represented junior high schools. A total of ten respondents stated that students doing production work or gaining hands-on experience was a program strength. These respondents were well distributed among the three school types. Eight respondents said one of the strongest aspects of their program was up-to-date equipment--five of these were from vocational-technical schools.

Four respondents, all from comprehensive schools, felt that the variety of practical arts offerings available was a strong asset of their programs. A like number indicated that a strength of their program was that instruction was being provided in a field where technical education was needed and where jobs were available. Likewise four schools said that a strong part of their program was the quality of the program and instruction. Three of each of the last two responses were from vocational schools.

Table 50

DISTRIBUTION OF SCHOOLS BY PRINCIPAL STRENGTHS OF THE GRAPHIC ARTS OFFERINGS AND BY TYPE OF SCHOOL

Strength Listed	Junior High	Comp. Jr/Sr High	Voc-Tech High	Total
Program gives broad, exploratory experience with career information	6	11	1	18
Students gain work experience	3	5	2	10
Up-to-date equipment	1	2	5	8
Provides needed training in field where jobs are available	0	1	3	4
Variety of practical arts experiences offered	0	4	0	4
Quality of program and/or instruction	0	1	3	4
Advanced courses available for interested students	2	0	1	3
Administrative interest and cooperation	0	1	2	3
Student interest	1	2	0	3
Adaptable to ability of students	1	0	1	2
Inexpensive	1	1	0	2
Opportunity to apply creativity	1	1	0	2
Teacher interest	1	1	0	2
New building	0	1	1	2
Economical printing for district	0	2	0	2
Good placement	0	1	1	2
District pays for supplies	0	2	0	2

Table 50 (Continued)

Strength Listed	Junior High	Comp. Jr/Sr High	Voc-Tech High	Total
Basis for hobby	0	1	0	1
Program is full	0	0	1	1
New to students	0	1	0	1
Freedom of student to choose projects	1	0	0	1
Offered early in student's educational career	1	0	0	1
Provides student with feeling of accomplishment	0	1	0	1
Develops management potential	0	0	1	1
Coordinates graphic arts with art, journalism, and business	0	1	0	1
Small classes	0	1	0	1
Program well-financed	0	0	1	1
Director cooperation	0	0	1	1
No response	3	4	1	8
Total Responding Schools	9	17	8	34
Total Responses	19	41	24	84

Three respondents said that a program strength was that advanced courses in graphic arts were available for interested students to follow the basic instruction. Three stated that students interest was a strong part of their program. In addition, three stated that administrative interest and cooperation was strong for their program. Nineteen other strengths were listed once or twice each.

The weaknesses of the graphic arts programs were likewise requested of the respondent. Thirty-five responded to this portion of the study. Fifteen respondents indicated that the greatest weaknesses included the need for more and up-to-date equipment; six of these were from junior high schools and eight from comprehensive schools. The lack of adequate laboratory time was cited as a principal weakness by ten schools--five junior highs and four comprehensive schools. Lack of space and lack of funds were each listed by nine respondents. Six respondents for each of these weaknesses were from comprehensive schools.

Four respondents listed teacher's lack of experience, large classes, and an over-abundance of weak students in graphic arts as principal weaknesses. All were mentioned by all types of schools. Lack of student interest and narrow coverage of graphic arts were each listed as great weaknesses by three schools. One or two respondents listed twenty other categories among the three principal weaknesses of their programs. Table 51 indicates the responses of all schools regarding program weakness.

Analysis of Data From Form III--Graphic Arts Course Content

The third part of the secondary educational survey of graphic arts instruction in Missouri involved Form III of the survey instrument.

Table 51

DISTRIBUTION OF SCHOOLS BY PRINCIPAL WEAKNESSES OF THE GRAPHIC ARTS OFFERINGS AND BY TYPE OF SCHOOL

Weakness Listed	Junior High	Comp. Jr/Sr High	Voc-Tech High	Total
More up-to-date equipment needed	6	8	1	15
Inadequate laboratory time	5	4	1	10
Inadequate space	2	6	1	9
Inadequate funds	2	6	1	9
Weak students counseled into graphic arts	1	1	2	4
Classes too large	2	1	1	4
Teacher lacks experience	2	1	1	4
Narrow coverage of graphic arts	1	1	1	3
Lack of student interest	1	1	1	3
Too much production work	0	0	2	2
Cooperation with guidance personnel inadequate	0	2	0	2
Poor job placement	0	1	1	2
Need more instructional media	0	0	1	1
Need more instructors	0	0	1	1
Student vandalism	0	1	0	1
Lack of local related jobs	0	1	0	1
Student arrival too varied	0	0	1	1
Lack of administrative interest	0	1	0	1
Weak textbook	0	0	1	1

Table 51 (Continued)

Weakness Listed	Junior High	Comp. Jr/Sr High	Voc-Tech High	Total
Poor instructor coordination	0	1	0	1
Lack of related programs	0	1	0	1
Poor class scheduling	0	1	0	1
No follow-up program	1	0	0	1
No classroom	0	1	0	1
Size of school	0	1	0	1
Typesetting	0	0	1	1
Classroom instruction	0	0	1	1
Grading system	0	0	1	1
Attendance penalty	0	0	1	1
No response	2	4	1	7
Total Responding Schools	10	17	8	35
Total Responses	23	40	21	84

It was intended that one of these forms be completed for every course of graphic arts in Missouri; however, this was not accomplished since not all schools responded to the short form, not all respondents to the short form completed the long form, and some long-form respondents did not complete Form III for all of their courses. The forty-two respondents who completed Part I reported a total of sixty-four courses. (See Table 28.) Fifty of these courses with completed or partially completed copies of Form III served as the sources of data for this part of the survey.

Levels of Instruction. The findings in Table 52 indicate the levels of instruction for the forty-five courses for which Form III was completed for this portion of the study. As would be expected the junior high courses are predominantly Level I, the vocational-technical school courses are Level IV, and the comprehensive school courses are of all four levels. As was indicated in earlier parts of the study, vocational graphic arts courses are offered in two of the comprehensive junior and senior high schools and this is reflected in the tabulations. Likewise a number of courses in grades 7 through 9 in the comprehensive school are of the Level I orientation type. This too is reflected in the tabulations.

Objectives. Objectives must be consistent with the level of the course and appropriate for accomplishing the instructional goals for each course. A number of general objectives were listed and respondents were asked to rank those objectives they felt were appropriate for the course under consideration on Form III.

Table 52

DISTRIBUTION OF GRAPHIC ARTS COURSES BY LEVELS OF INSTRUCTION AND BY TYPE OF SCHOOL

Level of Instruction	Junior High		Comp. Jr/Sr High		Voc-Tech High		Total	
	#	%	#	%	#	%	#	%
Level IV: occupational preparation	0	0.00	2	4.44	9	20.00	11	24.44
Level III: specialization	1	2.22	4	8.89	0	0.00	5	11.11
Level II: exploration	1	2.22	6	13.33	0	0.00	7	15.55
Level I: orientation	11	24.44	11	24.44	0	0.00	22	48.89
Total Courses	13	28.88	23	51.10	9	20.00	45	100.00*

*May not total 100 percent due to rounding error.

Table 53 shows the percent of each type of school that ranked each objective, the mean ranking given by those who considered that objective as being appropriate for the course, and the rank order of each objective for that type of school.

In the junior high school courses, the objectives with the three top ranks each received ninety-two percent support. Objective number 2--"Develop student interest in graphic arts" received the highest mean ranking with 1.91; objective number 1--"Acquaint students with graphic arts careers" was the second ranking objective with a 2.41 mean ranking; and objective number 6--"provide exploratory experience in graphic arts

Table 53

PERCENT OF SCHOOLS RANKING, MEAN RANKING, AND RANK ORDER OF STATED OBJECTIVES FOR GRAPHIC ARTS COURSES BY TYPE OF SCHOOL (NUMBER OF SCHOOLS = 42)

Objective	Junior High (13 Courses)			Comp. Jr/Sr High (28 Courses)			Voc-Tech High (9 Courses)			Total (50 Courses)		
	Percent Responding	Mean Rank	Rank Order	Percent Responding	Mean Rank	Rank Order	Percent Responding	Mean Rank	Rank Order	Percent Responding	Mean Rank	Rank Order
1	92	2.41*	2	80	2.54*	2	89	3.63*	6	84	2.71*	2
2	92	1.91	1	90	2.20	1	89	3.50	4	90	2.35	1
3	64	4.50	4	65	3.88	4	44	3.50	4	60	4.00	5
4	46	4.67	6	46	4.54	6	78	3.14	2	52	4.19	6
5	38	6.40	7	42	3.91	5	100	1.22	1	52	3.46	3
6	92	3.10	3	57	3.75	3	44	3.50	4	64	3.50	4
7	46	6.67	8	54	4.81	7	56	6.40	7	52	5.57	7
8	70	4.55	5	50	5.71	8	44	7.75	8	54	5.63	8

*The lower the numerical value, the higher the ranking.

Objective 1. Acquaint students with graphic arts careers.
2. Develop student interest in graphic arts.
3. Build special skills in one area of graphic arts.
4. Provide job entry skill in a specific graphic arts job.
5. Provide job entry skill in a cluster of graphic arts occupations.
6. Provide exploratory experience in graphic arts occupational clusters.
7. Prepare students for college to pursue majors related to graphic arts.
8. Help students to become better consumers of graphic arts products.

occupational clusters" received the third highest ranking with 3.10. Although the number of respondents accepting each objective was not the same, objectives 3, 4, and 8 were close in mean value. Likewise, in the junior high schools, the mean ranking of objectives 5 and 7 were close, but clearly lower than other objectives. As would be expected, these two objectives were accepted and ranked by fewer than half of the junior high respondents.

In the comprehensive junior-senior high schools, objectives 2 and 1 were again ranked highest with mean rankings of 2.20 and 2.54 respectively. Ninety percent of the respondents of this type of school accepted objective 2 and eighty percent accepted objective 1. The percentages of respondents accepting objectives 6, 3, and 5 were lower and varied; however, the mean rankings of these three objectives were quite close. Likewise the mean rankings for objectives 4 and 7 were numerically close. Objective 8 was lowest in mean rank of those objectives listed for the comprehensive schools.

In the vocational schools all respondents accepted objective 5, "provide job entry skill in a cluster of graphic arts occupations", and clearly gave it the highest mean ranking of 1.22. For vocational schools, objectives 7 and 8 received considerably lower mean ranking than the other objectives listed. The remaining objectives were grouped between these extremes.

There seems to be general acceptance in the schools of Missouri of the commonly recommended objectives for graphic arts at the various levels of instruction.

Reproduction Processes Used. Table 54 shows the percentage of total class time devoted to the four principal reproduction processes--

Table 54

DISTRIBUTION OF COURSES BY PRINCIPAL REPRODUCTION PROCESSES, PERCENTAGE OF CLASS TIME, AND TYPE OF SCHOOL

Percentage of Class Time	Junior High (13 Courses)				Comp. Jr/Sr High (28 Courses)				Voc-Tech High (9 Courses)				Total (50 Courses)			
	R*	P*	S*	I*	R*	P*	S*	I*	R*	P*	S*	I*	R*	P*	S*	I*
100	1	0	4	0	2	2	4	0	0	1	0	0	3	3	8	0
90-99	2	0	0	0	1	2	1	0	0	5	0	0	3	7	1	0
75-89	1	0	0	0	2	4	1	0	0	3	0	0	3	7	1	0
51-74	0	1	1	0	0	3	2	0	0	0	0	0	0	4	3	0
26-50	2	0	1	0	0	2	4	0	0	0	0	0	2	2	5	0
11-25	1	0	2	0	4	2	0	1	3	0	0	0	8	2	2	1
1-10	0	1	2	0	5	2	5	3	5	0	0	0	10	3	7	3
None	4	9	1	11	4	8	8	21	1	0	9	9	16	17	18	41
Total Courses in Responses	11**				25***				9				45			

*R=relief; P=planographic; S=stencil; and I=intaglio.

**One additional course was all bookbinding and one form was not completed.

***Three additional courses were all photography.

relief, planographic, stencil, and intaglio. In the junior high schools most emphasis was placed on the relief and stencil processes. Ten of the eleven junior high schools courses reported included some stencil printing and four used this method exclusively. The seven courses not using stencil printing exclusively included some relief printing and two also included the planographic method. No junior high school included any work in the intaglio process.

In the comprehensive schools, eight of the twenty-five courses reported included no planographic and/or no stencil printing, four included no relief printing and twenty-one included no intaglio work. Four courses reported using stencil method exclusively with two each using only relief and planograpny. The mix of the four reproduction processes was better among the courses in comprehensive schools then among the other two types of schools; yet several courses of these schools also used one or two processes exclusively.

Among the reported courses in vocational schools, none included the stencil or intaglio processes and all used planography at least three-fourths of the time. The remaining time was devoted to activities related to relief printing. In only one vocational school was relief printing totally omitted and planography used exclusively.

The relative use of the four principal reproduction processes may be studied in more detail in the following section of this report where instructional topics are examined.

Instructional Topics. In this section of the study more than four hundred instructional topics were evaluated for the depth of coverage given each topic in the fifty courses reported. The depth of coverage for each instructional topic included in a specific course was indicated on Form III with a circle drawn around the appropriate number. The following numerical code was used by the respondents for indicating depth of coverage:

0--None: not covered in this class
1--Mentioned: brief coverage, less than average
2--Moderate: average coverage, generally at a level with major portion of course
3--Considerable: more than normal coverage
4--Extensive: maximum coverage in time available

The number of courses which included each topic was recorded and a mean value was calculated for each topic indicating the extent of coverage for each type of school. These are shown in Table 55 to the right of each listed topic.

In order to provide a simple code to indicate the approximate extent of coverage of each instructional topic in the graphic arts programs of Missouri's secondary schools, the mean value was converted to a 0-to-4 scale similar to that used by the respondents in completing the information form. If the mean value for an instructional topic was below 0.67, it was concluded that generally the topic was "not covered" in the graphic arts classes in that type of school and a coverage code of "0" was assigned. A coverage code of "1" was assigned if the mean value fell between 0.67 and 1.49 indicating "brief" coverage of the topic. Likewise coverage codes of "2" and "3" were assigned to mean values from 1.50 to 2.49 and from 2.50 to 3.33 respectively indicating "moderate" and "considerable" coverage of the topic in a specific type of school. A coverage code of "4" was assigned when the mean value fell between 3.34 and 4.00, indicating "maximum" coverage of that topic. These coded coverage values for each type of school are shown to the left of each instructional topic in Table 55.

Table 55

EXTENT OF COVERAGE OF GRAPHIC ARTS INSTRUCTIONAL TOPICS BY TYPE OF SCHOOL

Topic Coverage Code**			Instructional Topic	Junior (13 Courses)		Comp. Jr/Sr (28 Courses)		Voc-Tech (9 Courses)	
				No. Crs.*	Mean Value**	No. Crs.*	Mean Value**	No. Crs.*	Mean Value**
J*	C*	V*	GRAPHIC ARTS: PAST, PRESENT, FUTURE						
1	2	1	History of Graphic Arts and Printing Industry	11	1.23	25	1.50	9	1.22
1	2	2	Size and scope of the graphic arts industry	11	1.31	23	1.61	9	1.67
1	2	2	Trends in present-day graphic arts industries	9	1.08	25	1.71	9	2.22
1	2	2	Future outlook for graphic arts industries	8	0.92	23	1.61	9	2.33
			CAREER AND JOB ORIENTATION						
1	2	2	Job opportunities and job titles in the graphic arts industry	12	1.31	27	1.96	9	2.11
1	2	3	Personal qualifications for graphic arts occupations (education, skills, physical attributes)	8	0.85	23	1.89	9	2.67
1	2	3	Duties of workers in graphic arts occupations	8	0.85	24	1.79	9	3.00
1	2	2	Working conditions, earnings, and employee job satisfaction in graphic arts occupations	9	0.92	22	1.64	9	2.78
1	2	2	Trends in graphic arts occupations	9	1.00	22	1.64	9	2.11
			SAFETY						
1	2	4	Principal safety rules and regulations of the graphic arts industry	10	1.46	22	1.96	9	3.44

Table 55 (continued)

2	2	3	Specific safety rules and regulations related to hazardous equipment and operations	10	1.69	20	1.93	9	3.22
1	1	2	Laws concerning safety in industry	9	1.46	19	1.46	9	2.33
1	2	2	First aid action following an accident or other emergency	10	1.46	19	1.54	8	2.33
			DESIGN AND LAYOUT						
2	3	2	Value of planning, designing, and layout	11	1.85	25	2.75	9	2.44
2	2	3	Basic design elements and principles	11	1.69	24	2.32	9	2.89
0	2	2	Basic principles of color	5	0.62	24	1.89	9	2.33
1	2	3	Point system of measurement	6	0.85	22	2.00	9	3.22
0	1	1	Metric system of measurement	2	0.15	12	0.68	8	1.11
1	2	2	Thumbnail sketches	7	0.69	22	2.07	9	2.22
1	2	3	Rough Layout	8	0.92	22	2.18	9	2.56
0	2	3	Comprehensive page and signature layout--dummy	3	0.46	19	1.82	9	2.78
1	2	2	Type styles	7	1.00	20	1.64	9	2.22
0	1	3	Copyfitting	3	0.23	18	1.36	9	2.78
			IMAGE GENERATION						
			Planography						
0	2	2	Methods of cold type composition	3	0.62	19	1.54	9	2.44
0	1	2	Strike-on composition	2	0.23	17	1.39	9	2.22
0	1	2	Dry transfer composition	1	0.08	16	1.14	8	1.56
0	1	2	Preprinted art, clip art	1	0.15	17	1.29	9	2.00
0	1	3	Phototypesetting display copy	1	0.23	17	1.43	9	3.22
0	1	3	Phototypesetting text copy	1	0.15	15	1.14	8	2.56
0	1	2	Computer typesetter (CRT, magnetic tape, or punched tape)	0	0.00	10	0.79	7	1.67
			Relief						
1	1	2	Methods of hot type composition	7	0.92	14	0.82	8	1.56
1	1	2	Line length and leading	7	0.77	14	1.04	8	2.11
1	1	1	Foundry and wood type	7	0.92	13	0.89	8	1.33
1	1	2	Spacing	7	1.08	15	1.36	8	2.33
0	0	1	Letter casting machines	5	0.46	10	0.46	6	0.78
0	0	1	Line casting machines	2	0.15	10	0.54	6	1.11

Table 55 (continued)

0	0	1	Remelting equipment for metal casting	1	0.08	6	0.46	5	0.78
0	0	1	Miter saw	0	0.00	6	0.39	5	0.89
			Intaglio						
0	0	0	Methods of generating images for gravure and engraving	2	0.15	7	0.46	2	0.22
			Stencil Process						
2	2	0	Techniques used to generate images in screen printing	11	1.85	18	1.61	1	0.11
1	0	0	Techniques used to generate images in mimeograph	5	0.77	11	0.61	1	0.11
			Continuous Tone Photography						
0	1	1	Types of cameras	1	0.08	14	1.25	5	1.44
0	1	2	Parts of a camera	1	0.08	13	1.25	5	1.67
0	1	2	Principles of black and white photography	1	0.08	14	1.43	6	1.89
0	1	1	Principles of color photography	0	0.00	10	0.75	6	1.22
0	1	2	Determining proper exposure	1	0.08	13	1.21	5	1.67
0	1	2	Film development	2	0.23	14	1.43	5	1.89
0	0	1	Color developing	0	0.00	7	0.46	3	0.67
0	1	1	Finishing and mounting prints	1	0.08	11	0.75	3	0.67
0	0	0	Color enlarging	0	0.00	4	0.21	2	0.33
0	1	1	Contact printing	1	0.08	11	0.89	5	1.33
0	0	1	Projection printing	0	0.00	9	0.64	3	0.67
0	0	1	Filters	0	0.00	8	0.57	4	1.00
0	1	1	Light exposure meters	0	0.00	10	0.68	4	1.00
0	0	1	Artificial lighting	0	0.00	9	0.57	4	1.11
0	1	1	Special effects	0	0.00	10	0.75	4	0.89
			Process Camera						
0	1	3	Types of process cameras	1	0.08	14	1.18	9	2.67
0	1	3	Basic parts of a process camera	1	0.08	14	1.32	9	3.00
0	1	4	Making a line negative	0	0.00	13	1.43	9	3.44
0	1	3	Types of film	0	0.00	15	1.36	9	3.11
0	2	4	Darkroom techniques	1	0.08	16	1.57	9	3.44
0	1	3	Making a contact print	1	0.08	12	1.04	9	2.67
0	1	3	Use of a stepped gray scale	0	0.00	15	1.43	9	2.89

Table 55 (continued)

0	1	2	Theory of densitometry	0	0.00	10	0.68	9	2.00
0	1	2	Light and filter theory	0	0.00	11	0.75	9	2.11
0	1	3	Computing halftone exposure	0	0.00	11	1.11	9	2.67
0	1	3	Making a halftone negative	1	0.08	11	1.18	9	3.11
0	1	2	Screen angles and types of screens	0	0.00	12	0.86	9	2.44
0	0	1	Process color separation	0	0.00	9	0.39	5	1.00
0	1	1	Shooting copy for posterization	0	0.00	11	0.71	5	1.00
0	0	2	Shooting copy for duotone	0	0.00	10	0.61	8	1.56
0	1	1	Diffusion transfer	1	0.08	9	0.82	4	1.11
0	1	3	Equipment and materials used in stripping	1	0.08	13	1.32	9	3.22
0	1	3	Stripping a single page, single color flat	1	0.08	13	1.46	9	3.33
0	1	3	Stripping a multiple page, single color flat	1	0.08	12	1.18	9	3.11
0	1	2	Stripping a multiple color flat	0	0.00	11	1.00	8	2.11
			IMAGE ASSEMBLY						
			Relief						
1	1	2	Tools and equipment used for lockup	5	1.00	11	0.93	8	2.00
1	1	2	Procedures used to lockup a form	5	1.00	11	0.96	8	2.00
0	1	2	Imposition of signatures	3	0.54	11	0.86	8	2.00
			Planography						
0	2	3	Instruments, equipment and tools used in copy preparation	1	0.15	15	1.64	9	3.22
0	2	3	Making a mechanical (paste-up)	1	0.15	15	1.64	9	3.33
0	1	3	Cropping and scaling art work for camera	0	0.00	13	1.32	9	3.00
0	1	3	Use of register marks	1	0.15	15	1.39	9	3.00
0	1	2	Mechanicals for multicolor reproduction	0	0.00	12	0.89	8	1.89
0	1	3	Imposition of signatures	1	0.15	14	0.96	9	2.89
			Intaglio						
0	0	0	Imposition for gravure	0	0.00	5	0.18	1	0.11
0	0	0	Imposition for engraving	0	0.00	6	0.21	1	0.11
			Stencil						
2	1	0	Imposition for screen printing	10	1.62	17	1.39	1	0.11
			Proofing						
0	1	3	Proofreading marks and procedures	3	0.46	18	1.46	9	3.00

Table 55 (continued)

1	1	2	Proofing methods used in relief printing	5	0.69	13	0.93	8	2.00
0	0	1	Proofing methods used in intaglio printing	0	0.00	6	0.39	3	0.67
0	1	3	Proofing methods used in planographic printing	2	0.15	14	1.29	8	2.56
0	1	0	Proofing methods used in stencil printing	4	0.62	14	1.04	3	0.56
			IMAGE CARRIERS						
			Relief						
1	1	2	Lock form in chase	4	0.92	11	1.00	7	1.78
0	1	1	Characteristics and uses of photoengravings	1	0.08	10	0.68	5	0.89
0	0	0	Electronic engraving	0	0.00	5	0.36	4	0.56
0	0	0	Stereotypes and electrotypes	1	0.08	8	0.57	5	0.56
0	0	0	Nonmetallic photosensitive image carriers	0	0.00	6	0.36	5	0.56
0	0	0	Rubber and thermoplastic image carriers	0	0.00	5	0.29	4	0.44
			Planography						
0	2	3	Equipment and tools used in platemaking	1	0.15	15	1.64	9	3.33
0	2	4	Making an offset plate	1	0.23	15	1.71	9	3.56
0	1	2	Procedures for step and repeat	1	0.23	12	1.18	9	2.33
0	1	3	Different types of plates used	1	0.23	15	1.29	9	3.00
0	1	3	Correcting plates	1	0.23	15	1.21	9	2.56
0	1	3	Preserving and storing plates	1	0.23	15	1.46	9	3.11
0	1	0	Spirit duplication	3	0.46	12	0.75	3	0.44
			Intaglio						
0	0	0	Engraving	1	0.08	6	0.36	1	0.11
0	0	0	Gravure metal cylinder	1	0.08	6	0.32	1	0.11
0	0	0	Electrically engraved plate	0	0.00	6	0.29	1	0.11
			Stencil						
2	1	0	Screen materials available	11	1.69	18	1.39	1	0.11
2	1	0	Attaching screen to frame	11	1.62	18	1.43	1	0.11
2	1	0	Adhering stencils	10	1.69	17	1.39	1	0.11
1	1	0	Lacquer base hand-cut stencil	10	1.46	17	1.25	1	0.11
1	1	0	Water base hand-cut film	6	0.92	14	1.00	1	0.11
0	1	0	Indirect photographic film	2	0.38	14	0.96	1	0.11
0	1	0	Direct photographic emulsion	3	0.54	14	1.21	1	0.11
1	1	0	Paper stencil	10	1.31	16	0.86	1	0.11
0	0	0	Tusche	1	0.23	12	0.61	1	0.11

Table 55 (continued)

2	2	0	Cleaning screens	10	1.69	18	1.54	1	0.11
0	0	0	Mimeograph stencil	5	0.62	12	0.64	1	0.11
			IMAGE TRANSFER						
1	2	3	Major printing processes	7	1.08	19	1.68	9	2.89
			Relief						
1	1	1	Types of relief presses	5	0.69	16	1.11	7	1.44
1	1	2	Principles of relief printing	5	0.69	16	1.29	7	1.56
1	1	2	Advantages and disadvantages of relief printing	5	0.69	16	1.14	7	1.78
0	1	2	Characteristics of relief printing	5	0.62	15	1.11	7	1.56
			Relief-Letterpress						
1	1	2	Basic principles of letterpress printing	6	1.08	16	1.36	8	2.00
1	1	2	Prepress operations in letterpress	5	1.00	11	1.00	7	1.78
1	1	2	Postpress operations in letterpress	5	0.92	11	0.93	7	1.78
1	1	2	Operations and controls in letterpress	5	0.92	10	0.89	7	1.78
0	1	2	Hairline registration	4	0.54	11	0.75	8	1.78
1	1	2	Makeready	5	0.92	10	0.89	7	1.89
1	1	2	Cleanup procedures	5	0.92	10	0.93	8	2.11
1	1	2	Proper care and use of rollers	5	0.85	10	0.89	8	2.22
1	0	2	Hand-fed, hand-operated platen press	6	1.08	6	0.46	6	1.67
0	1	1	Hand-fed, power-operated platen press	2	0.31	10	0.86	6	1.33
0	0	2	Automatic-fed, power-operated platen press	2	0.31	4	0.14	7	1.56
0	0	0	Hand-fed, power-operated cylinder press	2	0.23	3	0.11	3	0.56
0	0	1	Automatic-fed, power-operated cylinder press	1	0.15	4	0.14	4	0.89
0	0	0	Sheet-fed rotary press	1	0.08	2	0.07	3	0.56
0	0	0	Web-fed rotary press	1	0.08	3	0.14	3	0.56
0	1	2	Operation of proof presses	2	0.46	9	0.68	7	1.67
0	0	2	Maintenance and care of a proof press	2	0.46	7	0.54	7	1.67
0	0	1	Embossing on a press	2	0.23	4	0.21	3	0.67
0	0	2	Numbering on a press	1	0.15	9	0.54	6	1.56
			Relief-Flexography						
0	0	0	Basic theory of the flexographic process	0	0.00	7	0.29	3	0.44
0	0	0	Operation of flexography presses	0	0.00	5	0.21	1	0.11
0	0	0	Characteristics of flexographic printing	0	0.00	6	0.29	2	0.22
0	0	0	Maintenance and care of flexographic presses	0	0.00	2	0.07	1	0.11

Table 55 (continued)

			Relief--Letterset (Dry Offset)						
0	0	1	Principles of letterset printing	1	0.31	7	0.39	4	0.67
0	0	0	Supplies and materials used in letterset	1	0.31	6	0.29	3	0.44
0	0	0	Steps of operations in letterset	1	0.31	7	0.39	3	0.44
0	0	0	Letterset presses	1	0.31	5	0.25	2	0.33
0	0	0	Ink theory and application for letterset	1	0.23	5	0.25	2	0.22
0	0	0	Roller and blanket care and maintenance	1	0.23	3	0.18	2	0.33
0	0	0	Feed systems	1	0.23	6	0.36	2	0.33
0	0	0	Delivery systems	1	0.23	6	0.36	2	0.33
			Relief--Thermography						
0	0	0	Equipment and supplies used in thermography	0	0.00	8	0.61	1	0.11
0	0	0	Operation of a thermographic machine	0	0.00	6	0.32	0	0.00
			Relief--Hot Stamping						
1	0	0	Equipment and supplies for hot stamping	4	0.77	6	0.32	1	0.22
1	0	0	Principles of hot stamping	4	0.77	7	0.36	2	0.44
1	0	0	Operation of a hand-operated hot stamping press	4	0.85	6	0.32	0	0.00
0	0	0	Operation of an automatic hot stamping press	1	0.15	5	0.21	1	0.22
			Relief--Rubber Stamping						
0	0	0	Theory of rubber stamp making	1	0.08	8	0.32	2	0.22
0	0	0	Rubber stamp materials and equipment	1	0.08	8	0.32	1	0.11
			Planography						
0	1	1	History of planography	2	0.23	13	1.00	7	1.11
0	1	1	Characteristics of planography	2	0.23	12	1.11	7	1.44
0	1	1	Advantages and disadvantages of planographic printing	2	0.23	12	1.07	7	1.33
			Planography--Offset lithography						
0	2	3	Theory of offset lithography	3	0.46	18	1.61	8	2.56
0	2	4	Principal systems on an offset press	2	0.31	18	1.71	9	3.44
0	2	4	Press preparation and operating adjustments	1	0.23	15	1.64	9	3.44
0	2	4	Cleaning the press	1	0.31	15	1.61	9	3.44
0	2	4	Offset press care and maintenance	1	0.31	15	1.68	9	3.44
0	2	3	Print on a one-color, sheet-fed press	1	0.31	15	1.57	9	3.33

Table 55 (continued)

0	0	1	Print on a multi-color, sheet-fed press	0	0.00	7	0.43	6	1.11
0	0	1	Print on a perfecting press	1	0.31	5	0.25	3	0.78
0	0	1	Print on a stream-fed press	0	0.00	5	0.25	5	1.44
0	0	0	Print on a web-fed press	0	0.00	5	0.25	4	0.56
			Planography--Spirit duplicating						
1	0	0	Principles of spirit duplicating	4	0.69	11	0.54	1	0.11
0	0	0	Care and maintenance of a spirit duplicator	2	0.31	7	0.36	1	0.11
			Intaglio						
0	0	0	Theory of gravure presses	2	0.23	7	0.46	4	0.44
0	0	0	Operation of a sheet-fed gravure press	0	0.00	5	0.29	1	0.11
0	0	0	Operation of a rotogravure press	0	0.00	5	0.29	1	0.11
0	0	0	Maintenance and care of gravure presses	0	0.00	2	0.07	1	0.11
0	0	0	Clean a gravure press	0	0.00	2	0.07	1	0.11
			Stencil--Screen						
2	2	0	Theory of screen printing	11	1.77	19	1.54	4	0.44
2	1	0	Types of surfaces to receive a screened image	11	1.69	17	1.43	3	0.33
2	2	0	Procedures for screen printing	11	1.85	17	1.64	2	0.22
2	1	0	Inks and block-out materials	10	1.62	17	1.46	2	0.22
1	1	0	Procedures for making a screen frame	9	1.46	16	1.29	2	0.22
2	1	0	Supplies and materials for screen printing	11	1.77	17	1.46	2	0.22
2	2	0	Clean up procedures	11	1.92	17	1.64	2	0.22
2	1	0	Methods of drying screen inks	10	1.54	17	1.18	2	0.22
1	1	0	Operating a hand-fed, screen printing press	7	1.00	13	0.89	2	0.22
0	0	0	Operating an automatic-fed, power-operated screen printing press	0	0.00	6	0.29	2	0.22
			Stencil--Mimeograph						
1	0	0	Principles of the mimeograph process	4	0.69	10	0.50	1	0.11
0	0	0	Operation of a mimeograph machine	2	0.15	6	0.32	0	0.00
0	0	0	Care and maintenance of a mimeograph machine	0	0.00	6	0.36	0	0.00
0	0	0	Cleaning a mimeograph machine	0	0.00	6	0.36	0	0.00
0	0	0	Types of office copiers	0	0.31	8	0.46	1	0.11

Table 55 (continued)

			FINISHING AND BINDING OPERATIONS						
			Finishing Operations						
1	2	3	Uses, principles and methods of cutting	5	0.92	18	1.50	9	3.00
0	1	3	Uses, principles and methods of folding	3	0.62	18	1.46	9	2.78
0	1	2	Uses, principles and methods of scoring	1	0.15	15	1.14	9	2.22
0	1	2	Uses, principles and methods of perforating	2	0.23	15	1.11	9	2.22
0	1	3	Uses, principles and methods of gathering	4	0.38	14	1.04	9	2.67
0	1	2	Uses, principles and methods of sorting	2	0.23	15	1.11	9	2.44
0	1	2	Uses, principles and methods of punching and drilling	5	0.62	14	0.96	9	2.33
0	0	1	Uses, principles and methods of die cutting	2	0.23	9	0.57	6	1.33
0	0	0	Uses, principles and methods of laminating	4	0.46	9	0.46	0	0.00
1	2	3	Uses, principles and methods of padding	5	0.77	19	1.68	9	2.67
0	1	2	Uses, principles and methods of wrapping	2	0.15	12	0.86	8	2.44
1	2	1	Hand-operated paper cutter	7	1.15	15	1.50	4	0.67
0	1	3	Power paper cutter	0	0.00	10	0.82	9	3.33
0	0	0	Programable power paper cutter	0	0.00	6	0.39	2	0.22
0	1	2	Automatic folder	0	0.00	12	1.04	9	2.33
0	1	2	Scoring on a folder	0	0.00	8	0.68	8	1.78
0	1	2	Scoring on a press	0	0.00	14	1.00	9	1.78
0	1	1	Perforating on a folder	0	0.00	9	0.71	6	1.00
0	1	1	Perforating on a press	0	0.00	15	1.11	8	1.44
0	0	1	Automatic gathering machines	0	0.00	7	0.32	6	0.78
0	0	0	Automatic sorting machines	0	0.00	7	0.36	5	0.56
0	1	3	Paper drills	0	0.00	10	0.82	9	2.56
0	0	1	Die cutting on a press	0	0.00	8	0.46	6	1.33
0	0	0	Laminating presses	1	0.08	6	0.25	0	0.00
1	1	3	Procedures in padding	5	0.92	16	1.46	9	2.56
0	0	0	Automatic wrapping machines	0	0.00	7	0.29	3	0.33
0	1	2	Wire stitchers	0	0.00	8	0.71	9	2.22
0	0	0	Automatic addressing machines	0	0.00	6	0.25	0	0.00
			Binding Operations						
0	0	2	Industrial bindery operations	4	0.38	12	0.57	7	1.56
1	1	2	Methods of binding	5	0.77	14	0.93	9	2.11
1	1	1	Types of book bindings	5	0.85	13	0.82	6	1.33
0	1	2	Parts of a book	3	0.23	12	0.71	8	1.56

Table 55 (continued)

0	1	2	Bookbinding supplies and equipment	3	0.38	12	0.68	8	1.67
0	0	1	Operating principles of bookbinding machines	1	0.08	7	0.29	8	1.44
			INKS AND PAPERS						
			Inks						
0	1	2	History of inks	4	0.38	14	1.04	9	1.67
1	1	2	Types of inks	5	0.69	22	1.46	9	2.44
0	1	2	Composition of ink	4	0.46	20	1.21	9	2.33
0	1	2	Principles of ink manufacturing	3	0.38	14	0.89	9	1.78
0	1	2	Mixing inks	3	0.23	19	1.25	9	2.00
0	1	2	Ink mixing systems	2	0.15	13	0.75	9	1.67
0	1	2	Correcting for varying ink conditions	1	0.08	15	0.96	9	2.11
0	1	2	Selecting inks for specific jobs	4	0.62	18	1.25	8	2.44
			Papers						
1	1	2	History of paper and papermaking	7	0.69	18	1.32	9	1.56
0	1	2	Kinds of papers	6	0.62	20	1.43	9	2.33
0	2	2	Basis weight of paper	5	0.54	19	1.50	9	2.33
0	1	2	Paper finishes and special treatments	3	0.46	19	1.36	9	2.44
0	1	2	Processes used to make paper	4	0.46	17	1.32	9	1.67
1	2	3	Standard sizes of paper	5	0.69	19	1.54	9	2.56
0	2	2	Grain and its effect in printing	3	0.54	19	1.54	9	2.44
0	1	2	Chemical composition of paper	3	0.38	14	0.89	9	1.89
0	1	2	Specifying and ordering paper	2	0.31	15	1.29	9	2.22
0	1	2	Using a stock cutting sheet	1	0.23	12	0.96	8	1.89
			MANAGEMENT						
0	1	2	Functions of management in graphic arts	2	0.23	14	1.04	9	2.00
0	1	2	Levels of management	2	0.23	14	0.96	9	1.89
0	1	2	Need for management in the graphic arts industries	2	0.15	14	1.07	9	2.11
0	1	2	Characteristics of a small printing firm	1	0.08	14	1.11	9	2.00
0	1	2	Characteristics of a large printing firm	2	0.15	12	0.93	9	1.89
0	1	2	Characteristics of newspaper printing firms	2	0.15	12	0.82	8	1.67
0	1	2	Requirements and duties of a manager	1	0.08	13	0.96	9	1.78
0	1	2	Opportunities for management positions	1	0.15	13	0.89	9	1.78
0	1	2	Material control	2	0.15	12	0.89	9	2.11

Table 55 (continued)

0	1	2	Material flow	2	0.15	13	1.00	9	2.00
0	1	2	Cost accounting	1	0.08	12	0.79	9	1.89
0	1	2	Production control	1	0.15	12	0.82	9	2.11
0	1	2	Production flow	1	0.15	13	0.93	9	2.00
0	1	2	Personnel	3	0.23	15	0.82	8	1.56
0	1	2	Quality control	3	0.23	15	1.00	8	2.44
0	1	2	Sales	1	0.08	14	0.79	8	2.00
0	1	2	Distribution	1	0.08	13	0.79	8	2.00
0	1	2	Printing cost estimating	1	0.08	17	1.18	8	2.11
			LAWS						
0	1	2	Legal restrictions in printing	3	0.31	15	1.00	7	2.11
0	1	2	Copyright laws	2	0.15	15	1.00	7	2.22
0	1	2	Counterfeit laws	2	0.15	13	0.93	7	2.33
0	1	2	Laws concerning pornography	2	0.15	12	0.71	7	1.67
0	0	2	Laws concerning libel	2	0.15	12	0.64	7	2.22
0	1	2	Moral and ethical considerations of a printer	2	0.15	14	0.82	7	2.44

*J = Junior High School; C = Comprehensive Junior/Senior High School; V = Vocational-Technical High School; No. Crs. = Number of responding courses which include that instructional topic.

**0--None; not covered in this class; mean value from 0.00-0.66.
1--Mentioned; brief coverage, less than average; mean value from 0.67-1.49.
2--Moderate; average coverage, generally at a level with major portion of course; mean value from 1.50-2.49.
3--Considerable; more than normal coverage; mean value from 2.50-3.33.
4--Extensive; maximum coverage in time available; mean value from 3.34-4.00.

It may be noted that in the junior high schools no topics received coverage codes higher than 2 and the topics with code 2 coverage were generally related to stencil printing, design, and safety. All phases of photography, as well as planographic and intaglio printing, were conspicuously absent from the junior high school courses as these topics received 0 coverage.

In the comprehensive junior/senior high schools, topics related to the scope and history of graphic arts, career and job orientation, safety, design and layout, and planographic printing fundamentals generally received coverage codes of 2. A few scattered topics in other categories likewise were rated as 2. Only one topic received a coverage code of 3, "value of planning, designing and layout". Most other topics received coverage ratings of 1, with a number of rather specialized topics being rated as 0.

In the vocational-technical high schools the topics related to career and job orientation, safety, design and layout, process camera photography, planographic printing, finishing and binding, ink and papers, management, and laws generally received coverage code ratings of 2, 3, or 4. Continuous tone photography and letterpress printing generally received 1 or 2 coverage codes, while intaglio and stencil printing were consistently omitted from vocational courses.

Chapter 4

SURVEY OF GRAPHIC ARTS INDUSTRIES OF MISSOURI

The second major portion of the Missouri Industrial and Educational Graphic Arts Survey was a survey of the graphic arts industries in Missouri. The first two aspects of this portion of the survey were to identify the survey population and to develop a survey instrument. The instrument was then mailed to the population, the data were coded and analyzed, and the report of the findings was made.

Selection of Survey Population

Since many surveys to the graphic arts industries have received a low percentage of response and since no listing of all in-plant graphic arts operations in Missouri was available for proper stratifying of a sample of this sub-group, the research team agreed that all firms in Missouri which could be identified as "probably conducting graphic arts operations" should be included in the study. So the initial task was to compile this "complete" mailing-list.

Since little information was available regarding in-plant printing activities, the research team felt that the findings for the commercial printers may differ from the in-plant firms on some important topics; hence, portions of the report were divided and analyzed within two sub-groups: (1) commercial and (2) in-plant.

The Missouri Directory of Manufacturing and Mining, 1973[151] published by the Missouri Division of Commerce and Industrial Development listed all manufacturing firms in the state by geographic location (city) and by product (Standard Industrial Code Classification). Those firms listed in the SIC 2700 section are traditionally considered the "printers and publishers" of industry and obviously would be included in the study population mailing list. Since the research team felt certain that graphic arts activities also were carried on in other sections of the manufacturing industries and in some non-manufacturing businesses, they attempted to obtain consensus on which other listed SIC classification in the Directory were closely related to printing and publishing as a part of the graphic arts, which manufacturing firms conducted in-plant graphic arts operations in support of its listed primary SIC activities, and which non-manufacturing firms not listed in the Directory conducted support graphic arts operations. However, little agreement regarding the scope of the in-plant graphic arts industry was readily available.

The In-Plant Printing Management and Printing Industries of America chapters in Missouri were contacted by letter for their endorsement of this industrial portion of the survey as well as their help in identifying more precisely the scope of the graphic arts industries. The initial written request and a telephone follow-up resulted in an endorsement from a National Vice-President of IPMA and the President of the Kansas City Chapter of PIA. These letters are shown in Appendix C. Although only Raymond Campbell, President of the Kansas City Chapter of

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[151] Missouri Division of Commerce and Industrial Development, Missouri Directory of Manufacturing and Mining, 1973. (Jefferson City: Missouri Division of Commerce and Industrial Development, 1973).

PIA, identified the SIC classifications which he considered as a part of the graphic arts, the other professional groups responded with mailing lists of members to be included in the study population.

The final mailing list of 1389 commercial printers consisted of (1) all firms listed in the SIC 2700 series of the Missouri Directory . . . , 1973; (2) a few printing firms known by the research team to be in operation, but not listed in the Directory; and (3) firms selected from the Directory as likely to include graphic arts activities. These latter firms were listed under one of the following SIC classifications: SIC 2399 Fabricated Textile Products, Not Elsewhere Classified; SIC 2641 Paper Coating and Glazing; SIC 2642 Envelopes; SIC 2643 Bags, Except Textile Bags; SIC 2645 Die-Cut Paper and Paperboard and Cardboard; SIC 2647 Sanitary Paper Products; SIC [illegible]48 Stationery, Tablets, and Related Products; SIC 2649 Converted Paper and Paperboard Products, Not Elsewhere Classified; SIC 2651 Folding Paperboard Boxes; SIC 2652 Set-up Paperboard Boxes; SIC 2653 Corrugated and Solid Fiber Boxes; SIC 2654 Sanitary Food Containers; SIC 2655 Fiber Cans, Tubes, Drums, and Similar Products; SIC 3554 Paper Industries Machinery and Equipment; SIC 3555 Printing Trades Machinery; SIC 3951 Pens, Mechanical Pencils, and Parts; SIC 3953 Marking Devices; and SIC 3993 Signs and Advertising Displays. Firms listed under these categories which rather obviously had no graphic arts activities were not included in the mailing list.

Although the research team added the names of a few firms listed under SIC classifications not included in the PIA recommendations and did not include the categories SIC 2893 Printing Ink and SIC 3861 Photographic Equipment and Supplies as PIA had recommended, the final mailing list of commercial firms was essentially those listed under classifications recommended by the PIA.

The mailing list of in-plant printing firms was difficult to obtain. The Printing Industries of America and In-Plant Printing Management Association chapters were able to provide names of some firms with captive, in-plant printing operations; however, their lists were of members only and were not comprehensive. In addition, no distributor of graphic arts equipment or supplies who was contacted agreed to release a mailing list of in-plant printing firms in Missouri. This information was generally guarded as confidential. However, several paper distributors and printing suppliers did release partial lists.

Since Dun and Bradstreet had surveyed in-plant printing practices a few years prior to the current investigation, this firm was able to provide additional names of Missouri firms. Therefore, even though some distributors had estimated that several thousand Missouri firms had in-plant printing activities and that a list of these firms could be obtained quite easily, diligent efforts by the research team compiled a mailing list of only 631 in-plant firms. Undoubtedly, a few of these firms were sent more than one form since addresses received from several sources were not always in agreement and the research team was not always certain if the differences represented one or more branches of a firm.

In summary, the overall population for the survey of the graphic arts industry included 1389 commercial printing firms and 631 in-plant printing firms, a total of 2020 plants. Address labels were printed by computer for each firm on the mailing list.

Development of the Industrial Survey Instrument

In order to survey the graphic arts industry the research team considered three methods of obtaining the data--(1) a personal interview with a representative of a stratified sample of the firms throughout the state, (2) a two-day consortium where representatives from a sampling of printing firms develop a concensus statement regarding industrial practices and employment needs, or (3) an information form mailed to all (or a sampling) of the firms in the state.

After consulting with several graphic arts educators, representatives of the Missouri State Department of Elementary and Secondary Education and representatives of industry, it was thought that the travel and lodging costs, the time involved for some industrial representatives, and the necessary smaller sampling with its increased opportunity for bias introduced by a few representatives would be greater in the first two methods. Therefore, the information form was selected as the method for gathering the data for the survey of industry.

It was thought that a single form to be sent to both the commercial and in-plant firms would be better than separate forms for each sub-group. Lower printing costs and better comparison of the two sub-groups were advantages of the single form even though perhaps a single form would not fit both groups precisely in a few cases.

Several other concepts paramount in the plans for developing the information form were: (1) the form should be rather comprehensive in its scope regarding personnel and operations of the graphic arts industry, (2) bulk mailing would greatly reduce the cost of postage, (3) business reply returns would also reduce postage costs for responses since only those forms returned would require postage, (4) a self-mailing booklet would reduce the cost of stuffing envelopes, (5) data from the returns should be easily coded for computer processing, and (6) a request for address corrections from the Postal Service would allow updating of incorrect addresses for a higher rate of reception of the information forms by the industries.

After studying survey forms used in industrial surveys and similar surveys of the graphic arts, a comprehensive information form was designed by the research staff. It contained a cover letter and six main sections: Major Industry Classification, Transfer Method, Employees, Plant Operations Performed, Presses and Materials, and Competencies. The body of the information form was designed to be printed on white paper with black ink. The cover was designed for eye-appeal, using black and red ink on buff or tan cover stock. The three-part cover formed a self mailer. One of the three sides of the cover would wrap around to hide the business reply return side of the cover for the initial mailing. However, this portion of the cover would be removed by the respondent for returning the form. After having one side of the cover removed, the address of the research director would now be visible for easy return of the completed form.

The research staff studied the format and content of the initial information carefully for improvements. Copies of the tentative form were prepared and reviewed by six persons familiar with various aspects of commercial and/or in-plant printing as well as the Supervisor of Industrial Arts Education and the Research Coordinating Unit staff of the Department of Elementary and Secondary Education in Missouri.

These persons suggested a few modifications in format and wording to shorten, simplify, clarify, or otherwise improve the survey form. The information form was then printed by the Central Missouri State University graphic arts production staff. (See Appendix D.)

Mailing of Information Forms

Nearly all of the information forms for the survey of the graphic arts industry in Missouri were mailed as part of bulk mailings. The initial mailing of 1378 forms to commercial printing firms was made on August 11, 1975. On August 14, 1975, an additional mailing was made to 398 in-plant printing firms. A follow-up letter was mailed on September 3, 1975, to the 1480 firms not responding to the initial mailing. (See Appendix D.)

Since an item included in a bulk mailing cannot be forwarded, the designation "address correction requested" was printed on the cover of the information form and a number of forms were returned by the U.S. Postal Service with corrected addresses. After the address labels were corrected and a number of in-plant firms were added to the original list, a mailing was made on September 15, 1975, to 402 firms which had not received the previous mailings. During the following two months a number of forms with corrected addresses continued to be returned. Corrected labels were attached and these forms were mailed first class since the volume was inadequate for a bulk mailing of 200 copies.

On November 19, 1975, a mailing of 1674 duplicate forms were mailed to firms not previously responding. Following each of the mailings, a number of forms were returned as "undeliverable," because some firms were no longer in business, had moved without leaving a forwarding address, or had moved prior to the postal limitation on providing new addresses.

If an attempt to locate a new address through telephone directories proved unsuccessful or an out-of-state address was found, no further processing of a form was attempted. Neither was there an attempt to mail forms returned with corrected addresses following the November 19 mailing.

Analysis of Responding Firms

Table 56 shows the number and percent of graphic arts firms in Missouri responding to the questionnaire. The original list of 2020 firms contained 506 names of firms which were found to have moved out-of-state, to have gone out-of-business, to have been engaged in manufacturing pursuits not primarily printing and publishing, or to have recently moved and may not have received the survey form. Therefore, it was thought that a revised list of firms which could have been expected to respond to the information form really should include only about 1514 firms. Of this revised list of firms 916 were commercial and 598 were in-plant.

A total of 231 commercial firms and 131 in-plant firms actually responded to the information form; however, of these respondents 90 commercial and 40 in-plant firms did not provide usable data. Therefore, only 141 commercial firms and 91 in-plant firms provided usable data and were included in the analysis of the data. The total of 232 usable responding firms represented 15.32 percent of the revised list or 11.49 percent of the original list. Both the commercial and in-plant percentages were slightly over 15 percent of the revised list, 15.39 percent and 15.22 percent respectively. Hence, it may be seen that the usable percentage represents only about fifteen percent of firms which could have been expected to respond.

This low percentage of response led the research director to wonder if the responding firms represented the overall printing industry

Table 56

NUMBER AND PERCENT OF COMMERCIAL AND IN-PLANT FIRMS RESPONDING TO THE INFORMATION FORM

Description of Action	Commercial		In-Plant		Composite	
	Number	Percent	Number	Percent	Number	Percent
Original List of Potential Firms	1389		631		2020	
Less firms unable to respond	473		33		506	
No longer in business in Missouri	(279)		(2)		(281)	
Not listed as "printing and publishing"	(119)		(0)		(119)	
Returned by post office with address correction--high probability that the firm did not receive the form	(75)		(31)		(106)	
Revised List of Graphic Arts Firms	916	100.0	598	100.0	1514	100.0
Less Other Non-responding Firms	685	74.78	467	78.09	1152	76.09
Responding Firms	231	25.22	131	22.91	362	23.91
Less Unusable Returns	90	9.83	40	6.69	130	8.59
No Graphic Arts	(56)		(32)		(88)	
Unusable Responses	(34)		(8)		(42)	
Usable Responses (Percent of Revised List of Firms)	141	15.39	91	15.22	232	15.32
Usable Responses (Percent of Original List)		10.15		14.42		11.49

or a specialized segment. Hence, the chi square statistical analysis was selected to see if the responding firms represented the total population of printing firms in Missouri.

Since the total population of in-plant printing firms in Missouri was unknown, it was difficult to assess the representativeness of this segment of the responding firms. However, assuming that the Missouri Directory of Manufacturing and Mining, 1973 truly listed all commercial printing firms in its SIC 2700 section, it was reasoned that this listing could be used to determine whether the responding commercial firms were similar to all listed commercial firms. It was accepted by the research team that if the responding firms were typically distributed on three criteria--size, location, and product classification--the respondents could be considered as typical of all commercial printing firms and that inferences based upon the findings from the respondents could be made for the entire population of commercial printing firms of Missouri. Since the percentages of returns for the commercial and in-plant firms were nearly identical, there was no reason to believe that the findings regarding the normality of the responding commercial firms could not be assumed for the in-plant sub-group as well.

Table 57 shows the distribution of both the total population and the 141 responding firms by type of printing done. These data are the tabulations of all firms listed in the SIC 2700 section of the Missouri Directory . . . , 1973 along with the tabulation of the responding firms listed in the SIC 2700 section. Since many firms in both lists did more than one type of printing and were listed under several SIC classifications, the total population was based upon 1884 total listings and the 141 responding firms were listed a total of 227 times.

Table 57

DISTRIBUTION OF ALL AND RESPONDING COMMERCIAL PRINTING FIRMS BY STANDARD INDUSTRIAL CODE CLASSIFICATION

Standard Industrial Code (SIC) Classification	All Commercial Firms*		Responding Firms (N=141)	
	#	%	#	%
2711	360	19.11	35	15.42
2721	38	2.02	7	3.08
2731	43	2.28	4	1.76
2732	29	1.54	6	2.64
2741	22	1.17	4	1.76
2751	570	30.25	61	26.87
2752	507	26.91	64	28.19
2753	39	2.07	6	2.64
2754	2	0.11	1	0.44
2761	64	3.40	4	1.76
2771	7	0.37	1	0.44
2782	44	2.34	5	2.20
2789	43	2.28	4	1.76
2791	63	3.34	11	4.85
2793	19	1.01	7	3.08
2794	11	0.58	1	0.44
2795	23	1.22	6	2.64
Totals	1884	100.00	227	100.00

*Represents all firms listed in the SIC 2700 Sections of Missouri Directory . . . , 1973.

Observation of the data shows that for each SIC classification the percentage difference between the responding firms and all commercial firms was less than four percent and percentage differences greater than two percent was found only on two categories with the larger percentages. The chi square analysis in Table 58 verified this observation and showed that the chi square total of 9.73 at the five percent confidence level with seven degrees of freedom was less than the 14.067 critical value required for significance. Thus, the types of printing accomplished by the respondents was not significantly different from that done by the commercial printers as a whole.

Since the chi square statistical approach is not recommended when expected frequencies are less than five, the categories with such low frequencies were grouped together as "miscellaneous" for this analysis.

Table 58

CHI SQUARE ANALYSIS FOR CLASSIFICATION DISTRIBUTION OF RESPONDING FIRMS BY STANDARD INDUSTRIAL CODE CLASSIFICATION

SIC Classification	Observed Freq. (f_o)	Expected Freq. (f_e)	Difference (f_o-f_e)	$\frac{(f_o-f_e)^2}{f_e}$
2711	35	43.4	-8.4	1.63
2731	4	5.2	-1.2	0.28
2751	61	68.6	-7.6	0.84
2752	64	61.1	2.9	0.14
2782	5	5.3	-0.3	0.02
2789	4	5.2	-1.2	0.28
2791	11	7.6	3.4	1.52
Misc.	43	30.6	12.4	5.02
Totals	227	227.0	0.0	9.73

The miscellaneous classification includes all classifications with expected frequencies of less than 5.

Critical value for chi square at the five percent confidence level with 7 degrees of freedom = 14.067.

The distributions of the responding firms and of all commercial printers in Missouri with regard to number of employees are shown in Table 59. Like the preceding table, these data are also tabulations taken from all firms listed in the SIC 2700 section of the Missouri Directory . . . , 1973 and from responding firms likewise listed. Again each firm was counted each time it was listed.

Table 59

DISTRIBUTION OF ALL COMMERCIAL PRINTING FIRMS AND THE RESPONDING FIRMS BY NUMBER OF EMPLOYEES

Number of Employees	All Commercial Firms* #	All Commercial Firms* %	Responding Firms #	Responding Firms %
1-3	595	31.58	32	22.69
4-10	589	31.26	47	33.33
11-25	317	16.83	25	17.73
26-50	146	7.75	13	9.22
51-100	113	6.00	16	11.35
101-200	37	1.96	3	2.13
201-500	45	2.39	2	1.42
501-1000	6	0.32	0	0.00
Over 1000	3	0.16	1	0.71
Not Given	33	1.75	2	1.42
Totals	1884	100.00	141	100.00

*Represents all firms listed in the SIC 2700 sections of Missouri Directory . . . , 1973.

A casual inspection of Table 59 reveals that only in the "1-3 employees" category and in the "51-100 employees" did the percentages between the responding firms and all firms differ more than approximately two percent. For the chi square analysis, categories with an expected frequency of less than five were grouped into the single "other" category. The chi square value of 10.96 shown in Table 60 approached the level of significance at the five percent confidence level with five degrees of freedom which was 11.070; however, the null hypothesis that the responding firms are from the entire population of commercial printers in Missouri in regard to the number of employees is sustained.

Table 60

CHI SQUARE ANALYSIS FOR DISTRIBUTION OF RESPONDING FIRMS BY NUMBER OF EMPLOYEES

Number of Employees	Observed Freq. (f_o)	Expected Freq (f_e)	Difference (f_o-f_e)	$\frac{(f_o-f_e)^2}{f_e}$
1-3	32	44.5	-12.5	3.51
4-10	47	44.1	2.9	0.19
11-25	25	23.7	1.3	0.07
26-50	13	10.9	2.1	0.40
51-100	16	8.5	7.5	6.62
Other	8	9.3	- 1.3	0.18
Totals	141	141.0	0.0	10.96

The "other" category includes all categories with expected frequencies less than 5; it actually represents all firms with more than 100 employees plus those where the number was not available.

Critical value for chi square at the five percent confidence level with 5 degrees of freedom = 11.070.

The final criterion used to ascertain the randomness of the responding firms in relationship to all commercial printing firms in Missouri was the location of the firms. Since the Area Reports of the U.S. Bureau of the Census related to printing and publishing provide information for only four specific city areas in Missouri,[152] the four areas surrounding the cities of Kansas City, St. Louis, St. Joseph, and Springfield were each considered separately from the rest of the state in this analysis. As for the previous two chi square calculations, data for this section were also tabulated from firms listed in the SIC 2700 section of the Missouri Directory . . . , 1973.

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[152] Bureau of the Census, Area Series: Missouri, loc. cit.

Table 61 shows that for each location the difference in distribution percentages between the responding firms and all commercial firms was less than three percent. In Table 62 the chi square analysis shows that these differences were not significant, since the chi square value of 6.24 was below the critical value for significance at the five percent level of confidence with four degrees of freedom which was 9.488.

Table 61

DISTRIBUTION OF ALL COMMERCIAL PRINTING FIRMS AND THE RESPONDING FIRMS BY LOCATION

Location	All Commercial Firms*		Responding Firms	
	#	%	#	%
Greater St. Louis	640	33.97	44	31.2
Greater Kansas City	411	21.82	27	19.1
Springfield	56	2.97	8	5.7
St. Joseph	36	1.91	5	3.5
Rest of the State	741	39.33	57	40.4
Totals	1884	100.00	141	100.00

*Represents all firms listed in the SIC 2700 sections of Missouri Directory . . . , 1973.

These three chi square calculations tend to substantiate that the differences between the responding population of printing firms and all of the commercial printing firms in Missouri are no greater than could be attributed to chance. With these findings in mind and with no evidence that a biased group of firms responded from either the non-SIC 2700 sections of the commercial subgroup or the in-plant subgroup, it may be assumed that the responding firms in this study are representative of the graphic arts industries in Missouri.

Table 62

CHI SQUARE ANALYSIS FOR DISTRIBUTION OF RESPONDING FIRMS
BY LOCATION OF FIRMS

Location	Observed Freq. (f_o)	Expected Freq. (f_e)	Difference (f_o-f_e)	$\frac{(fo-fe)^2}{fe}$
Greater St. Louis***	44	47.9	-3.9	0.32
Greater Kansas City***	27	30.8	-3.8	0.47
Springfield	8	4.2	3.8	3.44
St. Joseph	5	2.7	2.3	1.96
Rest of the State	57	55.4	1.6	0.05
Totals	141	141.0	0.00	6.24

Critical value for chi square at the five percent confidence level with 4 degrees of freedom = 9.488.

***Includes surrounding cities as reported in the Missouri Directory of Manufacturing and Mining, 1976.

Treatment of Data

Upon return of the information forms, the data were coded by the research staff and data processing cards were prepared by the Central Missouri State University Data Processing and Research Center. Printouts of the computer analysis of these data were developed and prepared through the Data Processing and Research Center.

For "Section VI--Competencies" the responses were analyzed by the Research Director, grouped by similar responses, and coded for processing.

Most analyses included the entire responding population--both in-plant and commercial printers; however, on selected topics tables were made for each of the two subfiles. For these topics the comparisons of subgroups are reported following the reports for the combined population.

A final section of the information form allowed for a name and address of persons who wished to be contacted by the nearest vocational school graphic arts program. These names were compiled and mailed to the Missouri State Supervisor of Industrial Arts who was asked to refer the names to the appropriate state supervisors and vocational graphic arts teacher.

Analysis of Data

The Missouri Industrial Graphic Arts Survey is broken down into six main sections: Major Industry Classification, Transfer Method, Employees, Plant Operations Performed, Presses and Materials, and Competencies. These six topics along with a short section on in-service training will comprise the sub-sections of this report.

Major Industry Classification

This portion of the report will describe the classification of work done in the graphic arts industries in Missouri. The classifications used are based upon the Standard Industrial Classification code used by the U.S. Department of Commerce and the Missouri Division of Commerce of Industrial Development but were modified to include categories appropriate for this investigation.

Composite group. More than one-fourth of the 232 responding firms used each of three printing classifications. Table 63 shows that 38.4 percent of the firms did general commercial printing, 31.0 percent did general office duplicating, and 29.7 percent of the firms printed business forms. From ten to twenty percent of the firms did newspaper and commercial printing, periodical publishing, printing of specialty items, trade plant support activities, fast copy center duplicating, and other printing. The only categories which were done by less than ten percent of the Missouri firms were book publishing, packaging printing, and greeting cards.

Within the various classifications it was interesting to note that most companies were not highly specialized. In only three classifications did a majority of the firms accomplish over half of their work load in one classification. In the "newspaper and commercial" classification, 70.0 percent of the firms did more than half of their work in this one area. The "trade plant" and "general commercial" classifications concentrated 60.0 percent and 52.8 percent of their work loads respectively in that one area. In both the "newspaper and commercial" and the "trade plant" classifications approximately half of the firms did at least ninety percent of their work in that classification.

At the other extreme, in the classifications of "book publishing", "packaging printing", "greeting cards", and "other"--the classifications generally checked by fewer firms--at least half of the firms doing some work in that area of graphic arts accomplished less than ten percent of their work load in that classification.

Among the classifications of printing checked by at least fifteen percent of the responding firms, only the "newspaper and commercial"

Table 63

DISTRIBUTION OF WORK LOAD OF GRAPHIC ARTS FIRMS BY MAJOR INDUSTRY CLASSIFICATION AND PERCENTAGE OF WORK LOAD

Classification	Total Respondents in Classification (N = 232)		No. of firms for which this classification represents:									
			Under 10% of Load		Under 30% of Load		Over 50% of Load		Over 70% of Load		Over 90% of Load	
	#	%*	#	%**	#	%**	#	%**	#	%**	#	%**
General Commercial	89	38.4	11	12.4	31	34.9	47	52.8	40	44.9	22	24.7
Newspaper and Commercial	40	17.2	5	12.5	9	22.5	28	70.0	23	57.5	19	47.5
Book Publishing	22	9.5	11	50.0	15	68.2	4	18.1	4	18.1	1	4.5
Periodicals	32	13.8	15	46.9	26	81.3	5	15.6	3	9.4	1	3.1
Packaging Printing	18	7.8	11	61.1	13	72.2	4	22.3	4	22.3	1	5.6
Business Forms	69	29.7	28	40.6	48	69.5	13	18.8	8	11.5	3	4.3
Greeting Cards	9	3.9	5	55.6	6	66.7	2	22.2	1	11.1	0	0.0
Printing of Specialty Items	44	19.0	19	43.2	29	66.0	9	20.4	7	15.9	4	9.1
Trade Plant	25	10.8	7	28.0	8	32.0	15	60.0	14	56.0	13	52.0
General Office Duplicating	72	31.0	20	27.8	37	51.4	28	38.9	23	32.0	12	16.7
Fast Copy Center	46	19.8	18	39.1	30	65.2	7	15.2	3	6.5	1	2.2
Other	27	11.6	14	51.9	27	100.0	0	0.0	0	0.0	0	0.0

*Percent of all 232 responding firms.

**Percent of firms which do some work in this classification.

classification tended to be rather specialized in its activities. The "business forms," "printing of specialty items," "general office duplicating," and "fast copy center" classifications were checked by firms accomplishing work in several classifications and were more multi-purpose in scope. The "general commercial" classification tended to have its constituents spread rather uniformly along the work load percentage continuum with some slight emphasis at both ends. An examination of the "commercial" and "in-plant" subgroups will follow.

Commercial Subgroup. Of the 141 responding commercial graphic arts firms more than half (56.0 percent) indicated that they did printing in the "general commercial" classification. Table 64 shows that 57.0 percent of these firms did a majority of their work in this area of the printing business. Between ten and twenty-five percent of the commercial firms indicated some work in the following classifications: newspaper and commercial (24.1 percent), business forms (19.1 percent), trade plant (15.6 percent), printing of specialty items (13.5 percent), and periodicals (10.6 percent).

As with the composite population, three classifications of the commercial subgroup emphasized a single type of printing activity. The classifications of "newspaper and commercial" (79.4 percent), trade plant" (63.6 percent), and "general commercial" (57.0 percent) again had more than half of their work load in the single category. In fact, in the first two aforementioned categories more than half of the firms did more than ninety percent of their work in the single area. These three classifications represent three of the four categories which included the greatest number of firms. All of the other categories had at least sixty percent of the responding firms showing less than thirty percent of their

Table 64

DISTRIBUTION OF WORK LOAD OF COMMERCIAL GRAPHIC ARTS FIRMS BY MAJOR INDUSTRY CLASSIFICATION AND PERCENTAGE OF WORK LOAD

Classification	Total Respondents in Classification (N = 141)		Number of firms for which this classification represents:									
			Under 10% of Load		Under 30% of Load		Over 50% of Load		Over 70% of Load		Over 90% of Load	
	#	%*	#	%**	#	%**	#	%**	#	%**	#	%**
General Commercial	79	56.0	7	8.9	25	31.6	45	57.0	38	48.1	21	26.6
Newspaper and Commercial	34	24.1	3	8.8	4	11.8	27	79.4	22	64.7	18	52.9
Book Publishing	12	8.5	5	41.7	8	66.7	3	25.0	3	25.0	1	8.3
Periodicals	15	10.6	3	20.0	12	80.0	2	13.3	1	6.7	0	0.0
Packaging Printing	11	7.8	7	63.6	8	72.7	2	18.2	2	18.2	1	9.1
Business Forms	27	19.1	14	51.9	21	77.8	1	3.7	1	3.7	1	3.7
Greeting Cards	8	5.7	5	62.5	6	75.0	1	12.5	0	0.0	0	0.0
Printing of Specialty Items	19	13.5	6	31.6	12	63.2	5	26.3	5	26.3	3	15.8
Trade Plant	22	15.6	5	22.7	6	27.3	14	63.6	13	59.1	12	54.5
General Office Duplicating	5	3.5	0	0.0	3	60.0	1	20.0	1	20.0	0	0.0
Fast Copy Center	10	7.1	6	60.0	9	90.0	1	10.0	1	10.0	0	0.0
Other	14	9.9	8	57.1	14	100.0	0	0.0	0	0.0	0	0.0

*Percent of 141 responses included in the commercial subgroup.

**Percent of firms which do some work in this classification.

work load in a single category. So except for the somewhat specialized shops in the three classifications of "newspaper and commercial," "trade plant," and "general commercial," other commercial printers tend to include several classifications of graphic arts activities in their work load.

In-plant Subgroup. The ninety-one responding in-plant graphic arts firms most often checked the classifications of "general office duplicating" (73.6 percent), "business forms" (46.2 percent), "fast copy center" (39.6 percent), and "printing of specialty items" (27.5 percent) as part of their work load. These data are shown in Table 65. Less than ten percent checked the "newspaper and commercial," "packaging printing," "trade plant," and "greeting cards" classifications as part of their work load.

For all classifications (except "greeting cards," which had only one respondent) at least half of all respondents indicated that less than thirty percent of their work load was from a single classification.

Additional evidence shown in Table 65 shows that for all categories (except the single greeting card response), at least 29.9 percent of the firms concentrated less than ten percent of their work in a single classification. The only category with more than two firms in the "more than 90 percent of the work load" category was the "general office duplicating" classification with twelve firms and 17.9 percent. However, this category received a lower than normal response between the fifty and ninety percent categories. These data indicate that, except for some in-plant printing facilities doing almost exclusively "general office duplicating", in-plant printing facilities in Missouri are diversified in the work they accomplish.

Table 65

DISTRIBUTION OF WORK LOAD OF IN-PLANT GRAPHIC ARTS FIRMS BY MAJOR INDUSTRY CLASSIFICATION AND PERCENTAGE OF WORK LOAD

Classification	Total Respondents in Classification (N = 91)		Number of firms for which this classification represents:									
			Under 10% of Load		Under 30% of Load		Over 50% of Load		Over 70% of Load		Over 90% of Load	
	#	%*	#	%**	#	%**	#	%**	#	%**	#	%**
General Commercial	10	11.0	4	40.0	6	60.0	2	20.0	2	20.0	1	10.0
Newspaper and Commercial	6	6.6	2	33.3	5	83.3	1	16.7	1	16.7	1	16.7
Book Publishing	10	11.0	6	60.0	7	70.0	1	10.0	1	10.0	0	0.0
Periodicals	17	18.7	12	70.6	14	82.4	3	17.6	2	11.8	1	5.9
Packaging Printing	7	7.7	4	57.1	5	71.4	2	28.6	2	28.6	0	0.0
Business Forms	42	46.2	14	33.3	27	54.3	12	28.6	7	16.7	2	4.8
Greeting Cards	1	1.1	0	0.0	0	0.0	1	100.0	1	100.0	0	0.0
Printing of Specialty Items	25	27.5	13	52.0	17	68.0	4	16.0	2	8.0	1	4.0
Trade Plant	5	3.3	2	66.7	2	66.7	1	33.3	1	33.3	1	33.3
General Office Duplicating	67	73.6	20	29.9	34	50.7	27	40.3	22	32.8	12	17.9
Fast Copy Center	36	39.6	12	33.3	21	58.3	6	16.7	2	5.6	1	2.8
Other	13	14.3	6	46.2	13	100.0	0	0.0	0	0.0	0	0.0

*Percent of 91 responses included in the in-plant subgroup.

**Percent of firms which do some work in this classification.

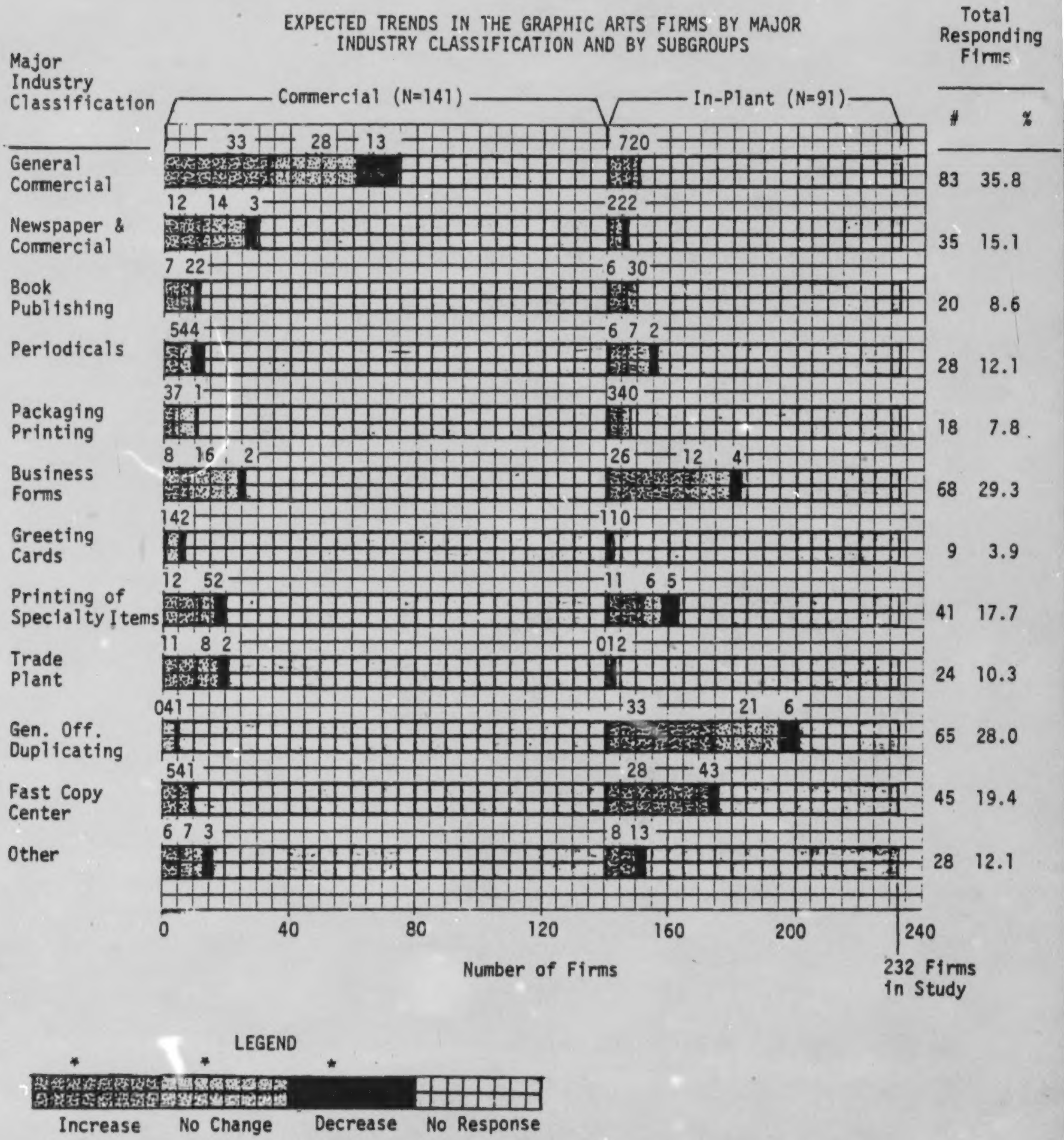
In addition to the distribution of firms by major industry classification, an examination of the trends of industry by classification was made.

Trends. The overall low response of graphic arts firms indicating their expected trends is quite visible as the reader examines Table 66. Among the commercial printing firms the greatest differences between firms expecting increases in their work load over those expecting decreases were in the classifications of "general commercial," "printing of specialty items," "newspaper and commercial," and "trade plant." In only two categories--"greeting cards" and "general office duplicating"--were the number of firms expecting decreases greater than those expecting an increase. For these classifications the low number of responses should be noted by the reader. A majority of commercial printers felt that the work load would remain the same for the "general office duplicating," "packaging printing," "business forms," and "greeting cards" classifications.

Among the in-plant printing firms, Table 66 shows that the firms expecting increases outnumbered those expecting decreases in all categories except "trade plant," where two of the three responding firms expected decreases, and in "newspaper and commercial," where two firms each marked the "increase" and "decrease" responses. In four categories none of the firms expected decreases. The classifications of "packaging printing" and "greeting cards" were expected to provide "no change" by at least half of the respondents. The low number of respondents in several of these categories should again be noted by the reader. In the in-plant printing subgroup, it appears that the important expected increases

Table 66

EXPECTED TRENDS IN THE GRAPHIC ARTS FIRMS BY MAJOR INDUSTRY CLASSIFICATION AND BY SUBGROUPS



*Numbers above graphs show the number of responding firms expecting this trend. Sequence of numbers is the same as the legend sequence: Increase, No Change, and Decrease. The number of non-respondents is not shown.

involving a significant number of firms are in the areas of "general office duplicating," "fast copy center," and "business forms."

Transfer Method

The second major division of the industrial survey involves an analysis of the image transfer methods used by the graphic arts firms in Missouri, including the percentage of the total work load done by each method. The findings are reported for the composite group of all responding firms and then for the commercial and in-plant subgroups.

Composite Group. The total population of 232 responding printing firms were asked to indicate the amount of their work load accomplished by various methods of image transfer. The data are presented in Table 67. Only four methods were included by more than ten percent of the respondents: lithography (70.3 percent), letterpress (33.2 percent), xerography (14.7 percent), and others (12.0 percent).

Only for the lithography transfer method do firms seem to concentrate on one method. For all other methods, at least half of the responding firms do less than thirty percent of their work with the one transfer method. On the other hand nearly half (49.1 percent) of the responding companies use lithography for at least ninety percent of their work. Although half of the firms using screen printing do less than thirty percent of their work load with this image transfer method, another one-third of the firms specialize in this method, using it for over ninety percent of their work load.

Commercial Subgroup. Among the 141 responding commercial printers shown in Table 68, lithography and letterpress dominate as the methods used for image transfer. A total of 61.7 percent of these firms

Table 67

DISTRIBUTION OF WORK LOAD OF GRAPHIC ARTS FIRMS BY TRANSFER METHOD AND PERCENTAGE OF WORK LOAD

Transfer Method	Total Respondents in Classification (N = 232)		Number of firms for which this classification represents:									
			Under 10% of Load		Under 30% of Load		Over 50% of Load		Over 70% of Load		Over 90% of Load	
	#	%*	#	%**	#	%**	#	%**	#	%**	#	%**
Lithography	163	70.3	7	4.3	17	10.4	128	78.5	113	69.3	80	49.1
Letterpress	77	33.2	34	44.2	40	52.0	20	26.0	17	22.1	12	15.6
Flexography	8	3.4	3	37.5	6	75.0	2	25.0	2	25.0	1	12.5
Letterset	5	2.2	3	60.0	4	80.0	1	20.0	0	0.0	0	0.0
Gravure	4	1.7	4	100.0	4	100.0	0	0.0	0	0.0	0	0.0
Engraving	7	3.0	3	42.9	4	57.1	1	14.3	1	14.3	1	14.3
Screen Printing	18	7.8	8	44.4	9	50.0	7	38.9	7	38.9	6	33.3
Xerography	34	14.7	20	58.8	29	85.3	4	11.8	1	2.9	0	0.0
Spirit Duplicating	18	7.7	14	77.8	16	88.9	1	5.6	1	5.6	1	5.6
Stencil Duplicating	20	8.6	14	70.0	18	90.0	0	0.0	0	0.0	0	0.0
Other	28	12.0	20	71.4	28	100.0	0	0.0	0	0.0	0	0.0

*Percent of all 232 responding firms.

**Percent of firms which use this transfer method.

Table 68

DISTRIBUTION OF WORK LOAD OF COMMERCIAL GRAPHIC ARTS FIRMS BY TRANSFER METHOD AND PERCENTAGE OF WORK LOAD

Transfer Method	Total Respondents in Classification (N = 141)		Number of firms for which this classification represents:									
			Under 10% of Load		Under 30% of Load		Over 50% of Load		Over 70% of Load		Over 90% of Load	
	#	%*	#	%**	#	%**	#	%**	#	%**	#	%**
Lithography	87	61.7	6	6.9	11	12.6	62	71.3	53	60.9	41	47.1
Letterpress	63	44.7	24	38.1	29	46.0	18	28.6	15	23.8	12	19.0
Flexography	6	4.3	3	50.0	5	83.3	1	16.7	1	16.7	1	16.7
Letterset	1	0.7	1	100.0	1	100.0	0	0.0	0	0.0	0	0.0
Gravure	2	1.4	2	100.0	2	100.0	0	0.0	0	0.0	0	0.0
Engraving	5	3.5	2	40.0	2	40.0	1	20.0	1	20.0	1	20.0
Screen Printing	13	9.2	3	23.1	4	30.8	7	53.8	7	53.8	6	46.2
Xerography	4	2.8	2	50.0	3	75.0	1	25.0	0	0.0	0	0.0
Spirit Duplicating	1	0.7	1	100.0	1	100.0	0	0.0	0	0.0	0	0.0
Stencil Duplicating	1	0.7	0	0.0	1	100.0	0	0.0	0	0.0	0	0.0
Other	17	12.1	15	88.2	17	100.0	0	0.0	0	0.0	0	0.0

*Percent of the 141 responding firms in the commercial subgroup.

**Percent of firms which use this transfer method.

used lithography while 44.7 percent of them used letterpress.

For all image transfer methods except lithography, letterpress, screen printing, and engraving at least three-fourths of the firms used a single method less than thirty percent of the time. Only 12.6 percent of the commercial firms used lithography as little as thirty percent of the time, 71.3 percent used it for a majority of their work, and 47.1 percent used it for over ninety percent of their work. A number of screen printing firms (46.2 percent) were rather specialized since they used this method for over ninety percent of their work. In addition between fifteen and twenty percent of the firms using letterpress, flexography, and engraving accomplished at least ninety percent of their work by that particular method.

In-plant Subgroup. Lithography was the overwhelming favorite image transfer method of the 91 responding in-plant printing firms shown in Table 69. More than 80 percent of the firms (83.5 percent) used some lithography and 86.8 percent of these used it for a majority of their work. Furthermore, over half of the firms which use lithography (51.3 percent) use it for at least ninety percent of their work load.

Other transfer methods used by at least ten percent of the in-plant firms are xerography (33.0 percent), stencil duplicating (20.9 percent), spirit duplicating (18.7 percent), letterpress (15.4 percent), and others (12.1 percent). However, at least three-fourths used each of these methods for less than thirty percent of their work load.

Trends. Although the number of responding firms is generally small, within the subgroups shown in Table 70, several trends seem especially noteworthy. The commercial printers reported distinct trends

Table 69

DISTRIBUTION OF WORK LOAD OF IN-PLANT GRAPHIC ARTS FIRMS BY TRANSFER METHOD AND PERCENTAGE OF WORK LOAD

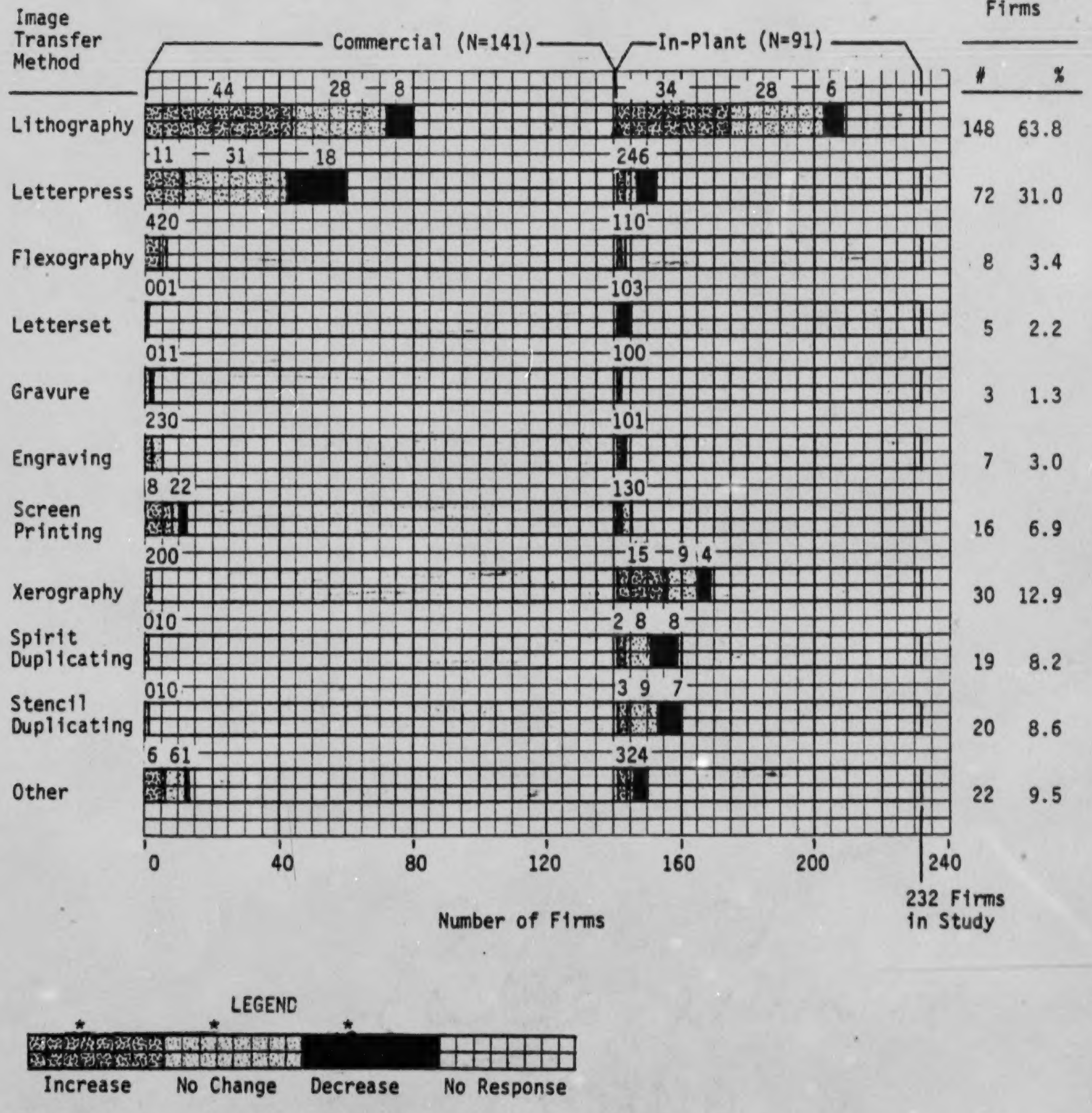
Transfer Method	Total Respondents in Classification (N = 91)		Number of firms for which this classification represents:									
			Under 10% of Load		Under 30% of Load		Over 50% of Load		Over 70% of Load		Over 90% of Load	
	#	%*	#	%**	#	%**	#	%**	#	%**	#	%**
Lithography	76	83.5	1	1.3	6	7.9	66	86.8	60	78.9	39	51.3
Letterpress	14	15.4	10	71.4	11	78.6	2	14.3	2	14.3	0	0.0
Flexography	2	2.2	0	0.0	1	50.0	1	50.0	1	50.0	0	0.0
Letterset	4	4.4	2	50.0	3	75.0	1	25.0	0	0.0	0	0.0
Gravure	2	2.2	2	100.0	2	100.0	0	0.0	0	0.0	0	0.0
Engraving	2	2.2	1	50.0	2	100.0	0	0.0	0	0.0	0	0.0
Screen Printing	5	5.5	5	100.0	5	100.0	0	0.0	0	0.0	0	0.0
Xerography	30	33.0	18	60.0	26	86.7	3	10.0	1	3.3	0	0.0
Spirit Duplicating	17	18.7	13	76.5	15	88.2	1	5.9	1	5.9	1	5.9
Stencil Duplicating	19	20.9	14	73.7	17	89.5	0	0.0	0	0.0	0	0.0
Other	11	12.1	5	45.5	11	100.0	0	0.0	0	0.0	0	0.0

*Percent of the 91 responding firms in the in-plant subgroup.

**Percent of firms which use this transfer method.

Table 70

EXPECTED TRENDS IN THE GRAPHIC ARTS FIRMS BY TRANSFER METHOD AND BY SUBGROUPS



*Numbers above graphs show the number of responding firms expecting this trend. Sequence of numbers is the same as the legend sequence: Increase, No change, and Decrease. The number of non-respondents is not shown.

for "increase" in the use of lithography, with some increase in flexography and screen printing. A majority predicted "no change" in letterpress usage.

The in-plant printers expect definite increases in the use of lithography and xerography and small "decreases" in the use of letterpress, spirit duplicating, and stencil duplicating. Other transfer methods seem to lack sufficient responses to establish a firm pattern.

The research director suspects that the trend responses regarding the letterset method may have been affected by confusion between the terms "letterpress" and "letterset".

Employees

The third major section of the study of the graphic arts industry deals with the employees. The number, background, desired educational level, and problem areas of the graphic arts employees are described.

Number of Employees Per Firm. Table 71 shows the distribution of graphic arts firms in Missouri by the number of employees. This table shows that graphic arts firms in Missouri are small, with two of every three firms having less than ten employees and seven of every eight having no more than twenty-five workers. The number of employees in the in-plant subgroup tended to be even smaller than in the commercial subgroup as the number of in-plant firms with one to three workers represented 34.8 percent of all firms, compared with 27.8 percent of the commercial group. Likewise, 93.2 percent of the in-plant firms had twenty-five employees or less compared with 83.4 percent of commercial firms.

Table 71

DISTRIBUTION OF GRAPHIC ARTS FIRMS BY NUMBER OF EMPLOYEES AND BY SUBGROUPS

Number of Employees	Composite Group		Commercial Subgroup		In-Plant Subgroup	
	#	%	#	%	#	%
1-3	68	30.6	37	27.8	31	34.8
4-10	82	36.9	49	36.8	33	37.1
11-25	44	19.8	25	18.8	19	21.3
26-50	10	4.5	9	6.8	1	1.1
51-100	9	4.1	8	6.0	1	1.1
101-200	3	1.4	3	2.3	0	0.0
201-500	3	1.4	1	0.8	2	2.2
501-1000	1	0.5	0	0.0	1	1.1
Over 1000	2	0.9	1	0.8	1	1.1
Total	222	100.0	133	100.0	89	100.0
Number of Employees Not Given	10		8		2	

Table 72 shows the breakdown of graphic arts firms by the number of employees and the number of classifications of printing used. This table indicates that a close relationship exists between the number of employees and the number of different classifications of printing accomplished,since the frequencies tend to group around the cells representing the smallest numbers. One-third of the firms were engaged in one printing classification, 27.9 percent claimed two classifications,

Table 72

DISTRIBUTION OF GRAPHIC ARTS FIRMS BY NUMBER OF EMPLOYEES, BY NUMBER OF CLASSIFICATIONS OF PRINTING USED, AND BY SUBGROUPS

Number of Employees	Number of Printing Classifications																				Total	
	One		Two		Three		Four		Five		Six		Seven		Eight		Nine		Not Given			
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
1-3	27	12.2	16	7.2	9	4.1	4	1.8	2	0.9	2	0.9	0	0.0	0	0.0	0	0.0	8	3.6	68	30.6
4-10	22	9.9	27	12.1	14	6.3	5	2.3	5	2.3	3	1.4	0	0.0	0	0.0	1	0.5	5	2.3	82	36.9
11-25	12	5.4	12	5.4	9	4.1	4	1.8	1	0.5	2	0.9	2	0.9	0	0.0	0	0.0	2	0.9	44	19.8
26-50	6	2.7	1	0.5	2	0.9	1	0.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	10	4.5
51-100	4	1.8	2	0.9	2	0.9	1	0.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	9	4.1
101-200	1	0.5	2	0.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	1.4
201-500	0	0.0	2	0.9	1	0.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	1.4
501-1000	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.5	0	0.0	0	0.0	0	0.0	0	0.0	1	0.5
Over 1000	2	0.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	0.9
Total Composite Group	74	33.3	62	27.9	37	16.7	15	6.8	8	3.6	8	3.6	2	0.9	0	0.0	1	0.5	15	6.8	222*	100.0
Commercial Subgroup	57	42.9	38	28.6	17	12.8	5	3.8	3	2.3	2	1.5	2	1.5	0	0.0	0	0.0	9	6.8	133*	100.0
In-plant Subgroup	17	19.1	24	27.0	20	22.5	10	11.2	5	5.6	6	6.7	0	0.0	0	0.0	1	1.1	6	6.7	89*	100.0

Number of missing observations = 10.

*Percentages within subgroups are based upon the total responses for that subgroup. All other percentages are based upon the 222 total firms responding to this section of the study.

16.7 percent claimed three classifications, and the remaining 22.1 percent either listed four or more classifications or did not give a number. Two-thirds of the firms used no more than three categories while employing less than twenty-five employees. The "1-3 employee x 1 classification" cell and the "4-10 employee x 2 classifications" cell received the greatest frequency with 27 firms. In the commercial subgroup more than forty percent of the firms were involved in only one classification of printing. In the in-plant subgroup, the firms more often were involved in from three to six classifications of work.

Likewise, as shown in Table 73, the distribution of firms by number of employees and number of transfer methods used was grouped around the smaller quantity cells for each variable. Most firms used either one or two transfer methods (33.8 percent and 38.3 percent respectively). The "4-10 employee x 2 methods" cell recorded the greatest frequency with thirty-eight firms. Seventy-one percent of the firms employed no more than twenty-five employees,while using no more than three transfer methods.

In the commercial subgroup less than ten percent of the firms employed more than two methods of image transfer. For the in-plant subgroup the percentage of those using more than two transfer methods was more than twenty-five.

Total Employees. The graphic arts firms were asked to indicate how many persons were employed in graphic arts activities in their firm. Table 74 shows that of the 232 responding firms in the survey, 218 (93.97 percent) provided data related to the total number of graphic arts employees in the firm. These firms reported a total of 8391 employers for a mean of 38.49 employees per firm and a median of 6.08 employees per

Table 73

DISTRIBUTION OF GRAPHIC ARTS FIRMS BY NUMBER OF EMPLOYEES, BY NUMBER OF TRANSFER METHODS USED, AND BY SUBGROUPS

Number of Employees	Number of Transfer Methods Used																				Total	
	One		Two		Three		Four		Five		Six		Seven		Eight		Nine		Not Given			
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
1-3	29	13.1	20	9.0	4	1.8	4	1.8	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	11	5.0	68	30.6
4-10	19	8.6	38	17.1	10	4.5	2	0.9	1	0.5	0	0.0	1	0.5	0	0.0	0	0.0	11	5.0	82	36.9
11-25	17	7.7	16	7.2	5	2.3	2	0.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	4	1.8	44	19.8
26-50	4	1.8	3	1.4	1	0.5	1	0.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.5	10	4.5
51-100	3	1.4	4	1.8	2	0.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	9	4.1
101-200	1	0.5	2	0.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	1.4
201-500	1	0.5	1	0.5	1	0.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	1.4
501-1000	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.5	0	0.0	0	0.0	1	0.5
Over 1000	1	0.5	1	0.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	0.9
Total Composite Group	75	33.8	85	38.3	23	10.4	9	4.1	1	0.5	0	0.0	1	0.5	1	0.5	0	0.0	27	12.2	222*	100.0
Commercial Subgroup	46	34.6	54	40.6	8	6.0	3	2.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	22	16.5	133*	100.0
In-plant Subgroup	29	32.6	31	34.8	15	16.9	6	6.7	1	1.1	0	0.0	1	1.1	1	1.1	0	0.0	5	5.6	89*	100.0

Number of Missing Observations = 10.

*Percentages within subgroups are based upon the total responses for that subgroup. All other percentages are based upon the 222 total firms responding to this section of the study.

Table 74

NUMBER OF GRAPHIC ARTS EMPLOYEES IN MISSOURI AND ANTICIPATED ADDITIONS OR REDUCTIONS

Category	Present Employees	Employees Added Since Jan. 1, 1974	Anticipated Replacements or Additions by Dec. 31, 1976	Anticipated Reduction by Dec. 3, 1976
		COMPOSITE		
Number of Employees	8391	318	303	57
Number of Reporting Firms	218	66	54	11
Mean Number of Employees Per Firm	38.49	4.82	5.61	5.18
Median Number of Employees Per Firm	6.08	1.92	2.14	2.00
		COMMERCIAL		
Number of Employees	4390	230	238	49
Number of Reporting Firms	129	41	35	7
Mean Number of Employees Per Firm	34.03	5.61	6.80	7.00
Median Number of Employees Per Firm	6.14	2.00	2.14	3.00
		IN-PLANT		
Number of Employees	4001	88	65	8
Number of Reporting Firms	89	25	19	4
Mean Number of Employees Per Firm	44.96	3.52	3.42	2.00
Median Number of Employees Per Firm	6.00	1.81	2.13	1.50

firm. The 129 commercial graphic arts firms responding to this section employed a total of 4390 employees, a mean of 34.03 employees per firm, and a median of 6.14 employees per firm. The 89 responding in-plant graphic arts firms employed a total of 4001 employees, a mean of 44.96 employees per firm, and a median of 6.00 employees per firm.

Firms were also asked the number of employees added between January 1, 1974, and the date of the response (between August and December of 1976). These data are also reported in Table 74. A total of 318 employees had been added by 66 firms during the designated period, a mean of 4.82 employees each. However, the median of 1.92 is probably a better indicator of the added workers per firm. The mean number of recent additions by commercial firms was 5.61 per firm, a number somewhat greater than the 3.52 mean number of in-plant additions. The comparative medians were 2.00 and 1.81 employees per firm.

Likewise, the additions and reductions anticipated before the end of 1976 were greater among commercial firms than among in-plant firms, both in total numbers and in mean number of additions or reductions anticipated. The total anticipated near-future change in employees was 246--303 additions less 57 reductions. This resulted in a difference between the mean increase and the mean decrease of 0.43 employees or a total employee increase of 2.93 percent for the period of less than eighteen months. However, the reader should note that only fifty-four firms reported expected increases and only eleven firms reported expected decreases.

In a further attempt to identify the present status of the graphic arts employees, firms were asked to identify the number of employees in each production area. Table 75 shows the distribution of employees by

Table 75

DISTRIBUTION OF GRAPHIC ARTS EMPLOYEES IN MISSOURI BY PRODUCTION AREAS AND SUBGROUPS

Production Area	Composite			Commercial			In-Plant		
	Total No. Empl.	No. Firms	Mean Empl. Per Firm	Total	No. Firms	Mean Empl. Per Firm	Total No. Empl.	No. Firms	Mean Empl. Per Firm
Diversified--works in several areas	483	112	4.31	237	65	3.65	246	47	5.23
Layout and Design	242	80	3.03	130	47	2.77	112	33	3.39
Copy Preparation	254	61	4.16	188	37	5.08	66	24	2.75
Hot Metal Composition	135	30	4.50	127	24	5.29	8	6	1.33
Photographic and Strike-on Composition	171	52	3.29	116	30	3.87	55	22	2.50
Continuous Tone Photography	68	19	3.58	40	12	3.33	28	7	4.00
Process Camerawork	151	48	3.15	74	35	2.11	77	13	5.92
Stripping	182	52	3.50	134	33	4.06	48	19	2.53
Proofing	83	41	2.02	59	30	1.97	24	11	2.18
Offset Platemaking	208	65	3.20	114	37	3.08	94	28	3.36
Relief Platemaking	7	5	1.40	3	3	1.00	4	2	2.00
Gravure Platemaking	0	0	0.00	0	0	0.00	0	0	0.00
Screen Process Platemaking	16	8	2.00	13	7	1.88	3	1	3.00
Offset Presswork	502	104	4.83	302	48	6.29	200	56	3.57
Relief Presswork	49	19	2.58	30	9	3.33	19	10	1.90
Gravure Presswork	40	2	20.00	0	0	0.00	40	2	20.00
Screen Process Presswork	38	8	4.75	38	8	4.75	0	0	0.00
Finishing	215	43	5.00	156	21	7.43	59	22	2.68
Binding	242	57	4.25	166	28	5.93	76	29	2.62
Sales	198	45	4.40	122	43	2.84	76	2	38.00
Estimating	68	42	1.62	59	35	1.69	9	7	1.29
Production Supervision	218	85	2.57	128	42	3.05	90	43	2.09
Other	190	36	5.28	162	25	6.48	28	11	2.55

production area for the composite responding group and for each of the two subgroups. Because of the low response to portions of this section of the survey the researcher felt that when the number of responding firms was less than ten the findings should not be emphasized.

In the composite population of responding firms, the production areas with the most employees were the "diversified" and "offset presswork" sections with 483 and 502 total employees respectively. Other areas with more than 200 employees reported were "layout and design," "copy preparation," "offset platemaking," "finishing," "binding," and "production supervision." For most of the production areas, responding firms employed an average of from three to five employees. The areas of "proofing," "relief platemaking," "screen process platemaking," "estimating," and "production supervision" had a mean number of employees less than two per firm and the "other" category had a mean number of employees greater than five per firm. No employees were reported in Missouri for the "gravure platemaking" area and the two firms doing gravure presswork had a mean of twenty employees in this area.

When comparing the commercial and in-plant subgroups, the mean number of employees per firm varied from the composite mean more than plus-or-minus one employee in the following areas: (1) the commercial subgroup had especially large mean numbers of employees and the in-plant subgroup had especially small mean numbers of employees in the areas of "offset presswork," "finishing," "bindery," and "other"; (2) the commercial subgroup has especially low mean numbers of employees and the in-plant subgroup had especially large mean numbers in the areas of "process camera work" and "sales"; and (3) the in-plant subgroup had especially low mean numbers of employees in the areas of "copy preparation" and "hot metal composition".

Background of Present Employees. Graphic arts firms were asked to indicate the background sources of their present employees. Table 76 shows the number of firms with employees in the various production areas coming to their firm from the various background sources. Each firm could indicate more than one source for each production area they had in their firm.

The most popular source of employees was "other shops or companies" which was indicated 261 times, by 23.25 percent of those 1123 responses included in this section of the study. The next most frequently mentioned source of employees was "off the street" (16.74 percent), "advancement within the company" (14.87 percent), and "general high school" (10.60 percent). The specialized pre-employment training sources of the "vocational-technical high school," the "technical or community college," and "college or university" were sources for only 3.74 percent, 3.29 percent, and 7.48 percent of the firms respectively.

"Other shops and companies" was rather consistently the most popular source of employees, being mentioned most frequently for each production area except "offset platemaking," "production supervision," and "other". In these three areas it was the second most popular source. "Advancement within the company" was the most frequent source of employees for the production supervision area and "off the street" was the most popular for the other two areas. Second and third choices were consistently from those sources mentioned above and ranking high in overall popularity. One unique source was "college and university" and was a close third choice in the area of layout and design. A few production areas reporting a total of less than ten firm responses were not included in these generalizations.

Table 76

DISTRIBUTION OF GRAPHIC ARTS FIRMS IN COMPOSITE GROUP BY BACKGROUND SOURCES OF PRESENT EMPLOYEES AND BY PRODUCTION AREA

Background Source	Diversified	Layout & Design	Copy Preparation	Hot Metal Comp.	Photo & St.-On Comp.	Cont. Tone Photo.	Process Camerawork	Stripping	Proffing	Offset Platemaking	Relief Platemaking	Gravure Platemaking	Screen Proc. Pltmkg.	Offset Presswork	Relief Presswork	Gravure Presswork	Screen Proc. Presswork	Finishing	Binding	Sales	Estimating	Prod. Supv.	Other	Total Resp. Firms	
Off the street	35	8	9	3	10	2	7	12	5	15	1	0	1	27	3	0	3	9	11	5	4	5	13	188	16.74
Other shops or companies	38	18	12	11	12	7	15	15	8	9	0	1	1	33	6	0	1	12	11	13	11	18	9	261	23.24
Newspaper Advertisements	18	6	6	3	6	1	0	1	4	3	0	0	1	8	0	0	2	1	4	4	0	2	2	72	6.41
General High School	21	8	9	1	8	4	6	5	4	8	0	0	1	19	2	0	0	4	7	2	1	4	5	119	10.60
Vocational-technical H S	10	4	4	2	4	2	1	1	0	2	0	0	0	8	0	0	1	0	0	0	1	0	2	42	3.74
Tech. or Community Coll.	8	5	3	0	0	0	2	0	0	3	0	0	1	7	0	0	0	1	0	2	1	2	2	37	3.29
College or University	18	16	7	1	1	1	5	4	3	4	0	0	0	3	0	0	0	0	0	8	4	6	3	84	7.48
Advancement Within Co.	27	17	11	5	8	2	5	8	4	9	0	0	2	16	3	0	1	3	3	5	6	26	6	167	14.87
Military	9	1	0	0	1	1	2	0	1	1	0	0	0	2	0	0	0	1	1	0	0	1	0	21	1.87
Employment Agencies	7	2	1	0	1	0	0	1	0	1	0	0	0	3	0	0	1	1	2	2	0	2	1	25	2.23
Family Member	19	2	5	2	2	2	5	2	2	2	0	0	0	7	1	0	1	3	9	6	5	6	6	87	7.75
Other	3	0	2	1	1	0	1	1	1	0	0	0	0	1	1	0	0	2	2	0	0	2	2	20	1.78

Within the two subgroups of commercial and in-plant printing, Table 77 and Table 78 respectively show that the overall pattern of employee background reported by the responding firms was similar to the composite group. Background sources with low response and production areas with no response are omitted in these tables. Two changes in the findings from the composite group were (1) that within the in-plant subgroup the overall most popular source of employees was "advancement within the company" and (2) that the fourth most popular overall source of employees in the commercial subgroup was "family member." Another special observation was that in the areas of "sales" and "estimating," in-plant printers seldom listed employees in these areas while the commercial printers often hired these employees from "colleges or universities".

Desired Educational Level For New Employees. In order to identify what is the desired educational level for the new graphic arts employees, firms were asked to check the desired educational level for employees in various production areas. Table 79 shows the responses of all graphic arts firms for each production area.

In order to better describe the responses of the graphic arts firms, a single numerical value representing the desired educational level for each production area was obtained. To obtain this single value a numerical code was assigned to each educational level and a mean value calculated for each area. "Less than high school adequate" was assigned a numerical value of 1, "general high school" was assigned a value of 2, "vocational-technical high school" was assigned a value of 3, "technical or community" college assigned a value of 4, and "college or university" was assigned a value of 5.

Table 77

DISTRIBUTION OF GRAPHIC ARTS FIRMS IN THE COMMERCIAL SUBGROUP BY SELECTED BACKGROUND SOURCES OF PRESENT EMPLOYEES AND BY SELECTED PRODUCTION AREA

Background Source	Diversified	Layout & Design	Copy Preparation	Hot Metal Comp.	Photo & St.-On Comp.	Cont. Tone Photo.	Process Camerawork	Stripping	Proofing	Offset Platemaking	Screen Proc. Pltmkg.	Offset Presswork	Relief Presswork	Screen Proc. Press.	Finishing	Binding	Sales	Estimating	Prod. Supv.	Other	Total Resp. Firms
Off the street	19	3	5	2	9	2	5	10	5	9	0	11	0	3	5	6	5	2	1	6	108
Other shops or companies	15	12	8	11	8	3	11	12	6	6	0	21	6	0	7	9	13	10	11	8	177
General High School	10	2	3	0	5	3	5	3	3	4	1	8	1	0	1	2	2	1	2	2	58
Vocational-technical H S	5	3	1	2	2	1	0	1	0	2	0	5	0	1	0	0	0	1	0	1	25
College or University	10	6	1	0	1	1	3	2	2	3	0	1	0	0	0	0	8	4	4	3	49
Advancement Within Company	12	8	4	3	4	1	2	3	3	3	2	6	1	1	2	1	5	5	13	4	83
Family Member	14	2	5	2	2	2	5	2	2	2	0	6	1	1	3	9	6	5	6	6	81

Table 78

DISTRIBUTION OF GRAPHIC ARTS FIRMS IN THE IN-PLANT SUBGROUP BY SELECTED BACKGROUND SOURCES OF PRESENT EMPLOYEES AND BY SELECTED PRODUCTION AREA

Background Source	Diversified	Layout & Design	Copy Preparation	Hot Metal Comp.	Photo & St.-On Comp.	Cont. Tone Photo.	Process Camerawork	Stripping	Proofing	Offset Platemaking	Offset Presswork	Relief Presswork	Finishing	Binding	Estimating	Prod. Supv.	Other	Total Resp. Firms
Off the street	16	5	4	1	1	0	2	2	0	6	16	3	4	5	2	4	7	78
Other shops or companies	23	6	4	0	4	4	4	3	2	3	12	0	5	2	1	7	1	81
General High School	11	6	6	1	3	1	1	2	1	4	11	1	3	5	0	2	3	61
Vocational-technical H S	5	1	3	0	2	1	1	0	0	0	3	0	0	0	0	0	1	17
College or University	8	10	6	1	0	0	2	2	1	1	2	0	0	0	0	2	0	35
Advancement Within Company	15	9	7	2	4	1	3	5	1	6	10	2	1	2	1	13	2	84
Family Member	5	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	6

Table 79

DISTRIBUTION OF RESPONSES FROM ALL GRAPHIC ARTS FIRMS TO DESIRED EDUCATIONAL LEVEL OF NEW EMPLOYEES BY PRODUCTION AREA

Production Area	Less Than High Sch. Adeq. (1)	General High Sch (2)	Voc-Tech High Sch. (3)	Tech. or Comm. College (4)	College or Univ. (5)	No. of Resp.	Mean Value
Diversified--works in several areas	3	39	31	12	4	89	2.72
Layout and Design	0	25	14	20	11	70	3.24
Copy Preparation	0	23	16	10	5	54	2.94
Hot Metal Composition	0	11	11	0	1	23	2.61
Photographic and Strike-on Composition	0	23	16	6	3	48	2.77
Continuous Tone Photograph	1	6	8	7	1	23	3.04
Process Camerawork	1	13	18	11	2	45	3.00
Stripping	3	15	20	6	2	46	2.76
Proofing	1	17	10	5	6	39	2.95
Offset Platemaking	5	23	26	2	1	57	2.49
Relief Platemaking	0	2	4	1	0	7	2.86
Gravure Platemaking	0	2	3	0	0	5	2.60
Screen Process Platemaking	0	7	5	0	0	12	2.42
Offset Presswork	2	29	44	4	0	79	2.63
Relief Presswork	0	5	9	1	0	15	2.73
Gravure Presswork	0	2	2	0	0	4	2.50
Screen Process Presswork	1	5	3	0	0	9	2.22
Finishing	6	15	12	1	0	34	2.24
Binding	2	28	13	1	0	44	2.30
Sales	0	9	4	3	26	42	4.10
Estimating	0	9	3	8	18	38	3.92
Production Supervision	0	14	10	15	23	62	3.76
Other	1	16	8	1	3	29	2.62
Total Responses	26	338	290	114	106	874	
Percentage of Total	2.97	38.67	33.18	13.04	12.13	100.0	

For the overall composite group a total of only 26 responses (2.97 percent) were recorded for "less than high school adequate," 338 responses (38.67 percent) were recorded for "general high school," 290 responses (33.18 percent) were recorded for "vocational-technical high school," 114 responses (13.04 percent) were recorded for "technical or community college," and 106 responses (12.13 percent) were recorded for "college or university." Hence, it appears that more than two-thirds of the responses indicate that a general high school or vocational-technical high school education is desired for graphic arts positions.

The most popular response for each production area was "general high school," except the areas of continuous tone photography, process camerawork, stripping, offset platemaking, relief platemaking, gravure platemaking, offset presswork, and relief presswork for which "vocational-technical high school" was a more frequent response and the areas of sales, estimating, and production supervision for which "college or university" was a more frequent response.

Production areas with a mean numerical response score as great as 3.00 were layout and design (3.24), continuous tone photography (3.04), process camera work (3.00), sales (4.10), estimating (3.92), and production supervision (3.76). All other areas received mean numerical response scores between 2.00 and 3.00.

Within the subgroups, the commercial firms most frequently indicated that "general high school" education was desirable (Table 80), while the in-plant firms most frequently recommended "vocational-technical high school" education (Table 81) for graphic arts workers. Exceptions to these generalizations were: (1) for the commercial printers the areas of stripping, offset presswork, and relief presswork received higher response

Table 80

DISTRIBUTION OF RESPONSES FROM COMMERCIAL GRAPHIC ARTS FIRMS TO DESIRED EDUCATIONAL LEVEL OF NEW EMPLOYEES BY PRODUCTION AREA

Production Area	Less Than High Sch. Adeq. (1)	General High Sch (2)	Voc-Tech High Sch. (3)	Tech. or Comm. College (4)	College or Univ. (5)	No. of Resp.	Mean Value
Diversified--works in several areas	2	22	16	5	3	48	2.69
Layout and Design	0	17	8	11	6	42	3.14
Copy Preparation	0	17	7	5	4	33	2.88
Hot Metal Composition	0	9	8	0	0	17	2.47
Photographic and Strike-on Composition	0	15	9	2	3	29	2.76
Continuous Tone Photograph	1	5	4	2	1	13	2.77
Process Camerawork	1	10	10	7	2	30	2.97
Stripping	2	9	11	4	1	27	2.74
Proofing	0	10	8	3	5	26	3.12
Offset Platemaking	4	15	10	1	1	31	2.35
Relief Platemaking	0	1	0	0	0	1	2.00
Gravure Platemaking	0	1	0	0	0	1	2.00
Screen Process Platemaking	0	6	3	0	0	9	2.33
Offset Presswork	2	18	19	2	0	41	2.51
Relief Presswork	0	2	4	1	0	7	2.86
Gravure Presswork	0	1	0	0	0	1	2.00
Screen Process Presswork	1	4	1	0	0	6	2.00
Finishing	5	8	4	1	0	18	2.06
Binding	1	16	4	1	0	22	2.22
Sales	0	8	3	2	24	37	4.14
Estimating	0	5	1	7	17	30	4.20
Production Supervision	0	5	3	6	19	33	4.18
Other	1	9	5	1	3	19	2.79
Total Responses	20	213	138	61	89	521	
Percentage of Total	3.84	40.88	26.49	11.70	17.08	100.0	

Table 81

DISTRIBUTION OF RESPONSES FROM IN-PLANT GRAPHIC ARTS FIRMS TO DESIRED EDUCATIONAL LEVEL OF NEW EMPLOYEES BY PRODUCTION AREA

Production Area	Less Than High Sch. Adeq. (1)	General High Sch (2)	Voc-Tech High Sch. (3)	Tech. or Comm. College (4)	College or Univ. (5)	No. of Resp.	Mean Value
Diversified--works in several areas	1	17	15	7	1	41	2.76
Layout and Design	0	8	6	9	5	28	3.39
Copy Preparation	0	6	9	5	1	21	3.05
Hot Metal Composition	0	2	3	0	1	6	3.00
Photographic and Strike-on Composition	0	8	7	4	0	19	3.32
Continuous Tone Photograph	0	1	4	5	0	10	3.40
Process Camerawork	0	3	8	4	0	15	3.07
Stripping	1	6	9	2	1	19	2.79
Proofing	1	7	2	2	1	13	2.62
Offset Platemaking	1	8	16	1	0	26	2.65
Relief Platemaking	0	1	4	1	0	6	3.00
Gravure Platemaking	0	1	3	0	0	4	2.75
Screen Process Platemaking	0	1	2	0	0	3	2.67
Offset Presswork	0	11	25	2	0	38	2.76
Relief Presswork	0	3	5	0	0	8	2.63
Gravure Presswork	0	1	2	0	0	3	2.67
Screen Process Presswork	0	1	2	0	0	3	2.67
Finishing	1	7	8	0	0	16	2.44
Binding	1	12	9	0	0	22	2.36
Sales	0	1	1	1	2	5	3.80
Estimating	0	4	2	1	1	8	2.88
Production Supervision	0	9	7	9	4	29	3.28
Other	0	7	3	0	0	10	2.30
Total Responses	6	125	152	53	17	353	
Percentage of Total	1.70	35.41	43.06	15.01	4.81	100.0	

frequency for the "vocational-technical high school" level, (2) for the commercial printers the areas of sales, estimating, and production supervision received a higher response frequency for the "college or university" level, (3) for the in-plant printers the production areas of diversified, photographic and strike-on composition, proofing, binding, estimating, production supervision, and other received a higher response frequency in the "general high school" level, (4) for the in-plant printers the areas of layout and design, continuous tone photography, and production supervision received a higher response frequency in the "technical and community college" level, and (5) for the in-plant printers the area of sales received a higher response frequency in the "college or university" level.

In general, the in-plant printers have a higher mean expected educational level than their commercial counterparts in most production areas. The opposite was true for the areas of proofing, relief presswork, sales, estimating, production supervision, and other.

Major Problems With Employees. The graphic arts firms in Missouri were asked to check those problems with employees which they found to be major for a specific production area of their firm. Table 82 shows that six problems were checked by the respondents with approximately equal frequency, each reporting between 10 percent and 13 percent of the 953 total responses. The most frequently checked problems were "lack of basic technical knowledge" (12.91 percent); "communications breakdown" (12.17 percent); "careless, inaccurate work" (11.75 percent); "inability to recognize and evaluate inferior work" (11.65 percent); "lack of speed" (10.49 percent); and "lack of understanding of entire production process" (10.39 percent). For most production areas, no single problem seemed to

Table 82

DISTRIBUTION OF GRAPHIC ARTS FIRMS IN COMPOSITE GROUP EXPERIENCING SELECTED PROBLEMS WITH EMPLOYEES BY PRODUCTION AREA

Problem Area	Diversified	Layout & Design	Copy Preparation	Hot Metal Comp.	Photo & St.-On Comp.	Cont. Tone Photo.	Process Camerawork	Stripping	Proofing	Offset Platemaking	Relief Platemaking	Gravure Platemaking	Screen Proc. Pltmkg.	Offset Presswork	Relief Presswork	Gravure Presswork	Screen Proc. Press.	Finishing	Binding	Sales	Estimating	Prod. Supv.	Other	Total Responding Firms #	Total Responding Firms %
Carelessness, inaccurate work	18	7	9	2	4	1	7	4	6	6	1	0	3	19	1	0	2	5	8	2	1	2	4	112	11.75
Communications breakdown	18	15	8	2	8	1	7	5	2	3	0	0	2	10	1	0	1	5	3	6	4	10	5	116	12.17
Lack of speed	17	9	9	4	8	2	4	7	3	4	0	0	0	12	3	0	2	5	8	0	1	0	2	100	10.49
Lack of basic technical knowledge	19	8	7	1	9	4	7	5	2	9	0	0	4	21	4	1	2	3	4	4	2	4	3	123	12.91
Lack of basic technical skills	11	10	9	0	7	5	4	3	2	6	0	0	1	16	1	0	1	5	3	1	1	2	4	92	9.65
Inability to recognize and evaluate inferior work	25	10	6	2	3	0	6	3	2	6	0	1	2	20	1	0	2	6	5	2	1	4	4	111	11.65
Lack of understanding of entire production process	19	6	5	3	5	2	4	4	3	4	1	1	2	8	3	1	1	3	5	5	6	5	3	99	10.39
Insufficient breadth of technical knowledge	10	5	2	0	5	4	3	3	2	7	1	0	0	12	2	0	0	5	6	2	3	6	3	81	8.50
Wasteful	8	1	2	0	2	0	2	1	1	3	0	0	1	13	0	0	1	4	4	2	1	1	3	50	5.25
Poor attitude	12	1	1	2	0	0	2	1	2	4	0	0	1	14	0	0	1	5	2	3	1	1	1	54	5.67
Other	1	0	1	0	2	0	1	0	0	1	0	0	0	1	0	0	0	1	3	0	0	3	1	15	1.57
Total Responses																								953	100.00

dominate as several problems were usually checked with almost equal frequency.

Plant Operations Performed

In order to identify the operations performed in each graphic arts firm as well as the extent to which each was used, respondents were asked to circle the "0" if the operation received "no usage" in their firm, to circle the "1" if the operation was "seldom used," to circle "2" if the operation received "moderate usage," and to circle a "3" if the operation received "maximum usage" in the company. The operations were grouped into thirteen major subdivisions to provide some structure for considering the extent to which various operations were used. When no number was circled for an operation it was assumed that the operation was not used by that firm.

Table 83 shows the distribution of responses of firms in the composite group for each operation along with the mean response value for each operation. It was thought that (1) if it was performed by at least twenty percent of the responding firms, (2) if it received a mean response value over 0.67, and/or (3) if it received more than a ten percent response in the "maximum usage" column, the operation could be considered as an important operation in the graphic arts industry of Missouri.

In the "layout and design" and "copy preparation" phases of graphic arts, some of both of these phases of the work were accomplished by the plant staff in approximately seventy percent of the firms; however, nearly half of the firms also used some work from outside agencies and from the customer. All three sources had mean response values above 0.67 in both sections of operations.

Table 83

USAGE OF GRAPHIC ARTS OPERATIONS BY THE COMPOSITE GROUP OF GRAPHIC ARTS FIRMS

Graphic Arts Plant Operation	No Usage 0		Seldom Used 1		Moderate Usage 2		Maximum Usage 3		Mean Response Value
	#	%	#	%	#	%	#	%	
Layout and Design									
*Layout and design done by outside agencies	113	48.7	68	29.3	39	16.8	12	5.2	0.78
*Layout and design done by plant staff	64	27.6	22	9.5	53	22.8	93	40.1	1.75
*Layout and design done by the customer	126	54.3	43	18.5	44	19.0	19	8.2	0.81
Other	222	95.7	2	0.9	2	0.9	6	2.6	0.10
Copy Preparation									
*Camera ready copy provided by outside agencies	127	54.7	47	20.3	41	17.7	17	7.3	0.78
*Camera ready copy prepared by plant staff	73	31.5	14	6.0	34	14.7	111	47.8	1.79
*Camera ready copy provided by customer	135	58.2	40	17.2	40	17.2	17	7.3	0.74
Other	221	95.3	1	0.4	3	1.3	7	3.0	0.12
Composition									
*Hand-set type	163	70.3	31	13.4	26	11.2	12	5.2	0.51
Ludlow	205	88.4	8	3.4	11	4.7	8	3.4	0.23
Monotype	225	97.0	3	1.3	2	0.9	2	0.9	0.06
*Line-casting machines--manual keyboarding	184	79.3	13	5.6	17	7.3	18	7.8	0.44
Line casting machines--tape operated	226	97.4	1	0.4	2	0.9	3	1.3	0.06
*Strike-on composition--manual	169	72.8	12	5.2	13	5.6	38	16.4	0.66
Strike-on composition--tape operated	202	87.1	4	1.7	10	4.3	16	6.9	0.31

Table 83 (continued)

*Photo typesetting--manual	151	65.1	11	4.7	22	9.5	48	20.7	0.86
*Pre-printed copy (clip art & transfer letters)	125	53.9	46	19.8	40	17.2	21	9.1	0.81
*Repro proofs for camera copy	150	64.7	21	9.1	36	15.5	25	10.8	0.72
Other	216	93.1	1	0.4	1	0.4	14	6.0	0.19
Imposition									
Hot type make-up	188	81.0	10	4.3	15	6.5	19	8.2	0.42
*Page imposition performed at the paste-up stage	158	68.1	5	2.2	22	9.5	47	20.3	0.82
*Film stripping for imposition	167	72.0	17	7.3	19	8.2	29	12.5	0.61
*Step and repeat imposition	184	79.3	18	7.8	18	7.8	12	5.2	0.39
Other	230	99.1	0	0.0	0	0.0	2	0.9	0.03
Continuous Tone Photography									
*Continuous tone photography done by outside agencies	182	78.4	25	10.8	14	6.0	11	4.7	0.37
*Continuous tone photography done by plant staff	163	70.3	10	4.3	19	8.2	40	17.2	0.72
Continuous tone photography done by customer	191	82.3	18	7.8	15	6.5	8	3.4	0.31
*Black and white	150	64.7	2	0.9	19	8.2	61	26.3	0.96
Color prints	195	84.1	14	6.0	13	5.6	10	4.3	0.30
Color transparencies	194	83.6	14	6.0	12	5.2	12	5.2	0.32
Film processed by outside agencies	186	80.2	17	7.3	11	4.7	18	7.8	0.40
*Film processed by plant staff	169	72.8	2	0.9	15	6.5	46	19.8	0.73
Film processed by customer	203	87.5	23	9.9	3	1.3	3	1.3	0.16
Enlargements/reductions done by outside agencies	187	80.6	18	7.8	12	5.2	15	6.5	0.38
*Enlargements/reductions done by plant staff	162	69.8	2	0.9	19	8.2	49	21.1	0.81
Enlargements/reductions done by customer	202	87.1	22	9.5	6	2.6	2	0.9	0.17
Duplicate transparencies for color separations done by outside agencies	195	84.1	10	4.3	10	4.3	17	7.3	0.35

Table 83 (continued)

Duplicate transparencies for color separations done by plant staff	219	94.4	1	0.4	4	1.7	8	3.4	0.14
Duplicate transparencies for color separations done by customer	221	95.3	9	3.9	2	0.9	0	0.0	0.06
Other	229	98.7	0	0.0	0	0.0	3	1.3	0.04
Reproduction									
*Line photography	130	56.0	0	0.0	17	7.3	85	36.6	1.25
*Contacting	150	64.7	15	6.5	18	7.8	49	21.1	0.85
*Halftone photography	133	57.3	9	3.9	31	13.4	59	25.4	1.07
Color separation--scanning	224	96.6	2	0.9	3	1.3	3	1.3	0.07
Direct screen color separation--conventional	208	89.7	7	3.0	7	3.0	10	4.3	0.22
Indirect screen color separation--conventional	215	92.7	6	2.6	4	1.7	7	3.0	0.15
Dot etching	211	90.9	8	3.4	4	1.7	9	3.9	0.19
*Densitometer readings of halftone work	195	84.1	3	1.3	9	3.9	25	10.8	0.41
Densitometer readings of color separations	205	88.4	6	2.6	8	3.4	13	5.6	0.26
*Paper positives, PMT, or line prints	153	65.9	8	3.4	26	11.2	45	19.4	0.84
*Multiple color special effects (duotones, posterizations, etc.)	178	76.7	20	8.6	18	7.8	16	6.9	0.45
*Tray processing	164	70.7	8	3.4	10	4.3	50	21.6	0.77
Stabilization processing	195	84.1	4	1.7	15	6.5	18	7.8	0.38
*Automatic film processing	195	84.1	2	0.9	6	2.6	29	12.5	0.44
Other	229	98.7	0	0.0	0	0.0	3	1.3	0.04
Stripping									
*Positive stripping	157	67.7	22	9.5	14	6.0	39	16.8	0.72
*Negative stripping on unprinted, unruled masking sheet	157	67.7	14	6.0	24	10.3	37	15.9	0.75
*Negative stripping on printed, ruled masking sheet	126	54.3	9	3.9	24	10.3	73	31.5	1.19

Table 83 (continued)

Other	222	95.7	1	0.4	3	1.3	6	2.6	0.07
Proofing									
*Line proofs	123	53.0	15	6.5	37	15.9	57	24.6	1.12
*Color proofs	180	77.6	11	4.7	14	6.0	27	11.6	0.52
Printing Plates									
Hand-set type	190	81.9	18	7.8	14	6.0	10	4.3	0.33
Monotype	229	98.7	3	1.3	0	0.0	0	0.0	0.01
Ludlow	216	93.1	3	1.3	8	3.4	5	2.2	0.15
Linotype and/or Intertype slugs	200	86.2	10	4.3	9	3.9	13	5.6	0.29
Stereotype plates	227	97.8	2	0.9	2	0.9	1	0.4	0.04
Photo-polymer plates (dycril, etc.)	221	95.3	2	0.9	3	1.3	6	2.6	0.11
Duplicate plates--electroplates	217	93.5	4	1.7	5	2.2	6	2.6	0.14
Photoengravings	211	90.9	5	2.2	8	3.4	8	3.4	0.19
Letterset	227	97.8	1	0.4	2	0.9	2	0.9	0.05
Rubber printing plates	216	93.1	6	2.6	6	2.6	4	1.7	0.13
Flexography plates	228	98.3	0	0.0	1	0.4	3	1.3	0.05
Other	229	98.7	0	0.0	0	0.0	3	1.3	0.04
Planography or Lithography (Offset)									
*Direct image masters	165	71.1	21	9.1	19	8.2	27	11.6	0.60
*Photo-direct plates	169	72.8	11	4.7	13	5.6	39	16.8	0.66
*Presensitized plates--positive working	169	72.8	3	1.3	23	9.9	37	15.9	0.69
*Presensitized plates--negative working	146	62.9	5	2.2	19	8.2	62	26.7	0.99
Wipe-on coating	197	84.9	5	2.2	8	3.4	22	9.5	0.38
Deep-etch plates (bi-metal, tri-metal, etc.)	219	94.4	6	2.6	5	2.2	2	0.9	0.09
Stone	229	98.7	1	0.4	0	0.0	2	0.9	0.03
*Electrostatic platemaking	190	81.9	4	1.7	6	2.6	32	13.8	0.48

Table 83 (continued)

Electrostatic platemaking with enlarging & reduction	205	88.4	5	2.2	8	3.4	14	6.0	0.27
*Electrostatic platemaking tied into automated offset	198	85.3	1	0.4	2	0.9	31	13.4	0.42
Spirit master (Ditto, etc.)	211	90.9	14	6.0	5	2.2	2	0.9	0.13
Other	229	98.7	2	0.9	1	0.4	0	0.0	0.02
Intaglio (Gravure)									
Gravure cylinders	231	99.6	0	0.0	0	0.0	1	0.4	0.01
Engraved plates	227	97.8	0	0.0	2	0.9	3	1.3	0.06
Other	232	100.0	0	0.0	0	0.0	0	0.0	0.00
Stencil									
Hand cut films	218	94.0	2	0.9	7	3.0	5	2.2	0.13
Paper stencils	222	95.7	3	1.3	4	1.7	3	1.3	0.09
Tusche stencils	229	98.7	3	1.3	0	0.0	0	0.0	0.01
Indirect photographic stencils	220	94.8	5	2.2	2	0.9	5	2.2	0.10
Direct photographic stencil emulsion	217	93.5	6	2.6	3	1.3	6	2.6	0.13
Mimeograph stencils	220	94.8	5	2.2	4	1.7	3	1.3	0.10
Other	231	99.6	0	0.0	1	0.4	0	0.0	0.01
Finishing and Binding									
*Folding, hand	119	51.3	65	28.0	36	15.5	12	5.2	0.75
*Folding, machine	85	36.6	8	3.4	48	20.7	91	39.2	1.62
*Trimming, manual	111	47.8	21	9.1	43	18.5	57	24.6	1.20
*Trimming, auto spacing	187	80.6	3	1.3	11	4.7	31	13.4	0.51
*Slitting	174	75.0	22	9.5	20	8.6	16	6.9	0.47
*Die cutting	175	75.4	19	8.2	21	9.1	17	7.3	0.48
*Punching	100	43.1	28	12.1	56	24.1	48	20.7	1.22
*Scoring	125	53.9	34	14.7	48	20.7	25	10.8	0.88

Table 83 (continued)

Embossing	203	87.5	11	4.7	9	3.9	9	3.9	0.24
*Numbering	132	56.9	28	12.1	38	16.4	34	14.7	0.89
*Perforating	103	44.4	35	15.1	61	26.3	33	14.2	1.10
*Drilling	105	45.3	26	11.2	55	23.7	46	19.8	1.18
*Collating, hand	99	42.7	27	11.6	61	26.3	45	19.4	1.22
*Collating, machine	139	59.9	10	4.3	29	12.5	54	23.3	0.99
Foil stamping	209	90.1	9	3.9	8	3.4	6	2.6	0.19
Tipping	199	85.8	8	3.4	13	5.6	12	5.2	0.30
*Padding	81	34.9	18	7.8	58	25.0	75	32.3	1.55
*Laminating	185	79.7	27	11.6	13	5.6	7	3.0	0.32
*Wrapping, hand	103	44.4	19	8.2	46	19.8	64	27.6	1.31
Wrapping, shrink	191	82.3	5	2.2	15	6.5	21	9.1	0.42
*Mechanical binding (metal, plastic, etc.)	147	63.4	23	9.9	41	17.7	21	9.1	0.72
Perfect binding	213	91.8	8	3.4	6	2.6	5	2.2	0.15
*Wire stitching and stapling	101	43.5	22	9.5	51	22.0	58	25.0	1.28
Case binding of books	211	90.9	7	3.0	9	3.9	5	2.2	0.17
*Mailing	131	56.5	14	6.0	37	15.9	50	21.6	1.03
*Stuffing	143	61.6	30	12.9	27	11.6	32	13.8	0.78
*Addressing	144	62.1	17	7.3	29	12.5	42	18.1	0.87
Other	224	96.6	1	0.4	3	1.3	4	1.7	0.08

*"No usage" indicated by less than 80 percent; therefore, at least 20 percent use to some extent and/or "Mean response value" is greater than 0.67 and/or "Maximum usage" indicated by at least 10 percent.

In the "composition" phase of graphic arts at least twenty percent of the firms did some operations involving hand-set type, line-casting machines--manual keyboarding, strike-on composition--manual, phototypesetting--manual; pre-printed copy (clip art and transfer letters), and repro proofs from camera copy. For the last three the mean response values also were above 0.67.

Table 83 also shows that for the "imposition" operations in graphic arts, page imposition performed at the paste-up stage, film stripping for imposition, and step and repeat imposition were all done to some extent by more than twenty percent of the firms. In addition, type make-up was used by nineteen percent of the firms. However, only the page imposition at paste-up received a mean response value above 0.67.

Within the "continuous tone photography" operations, almost thirty percent of the graphic arts firms had continuous tone photography done by the plant staff, had the film processed by the plant staff, and had enlargements/reductions done by the plant staff. In all cases the mean response value was above 0.67, with a large percentage of the firms checking "maximum usage" of each. In addition, almost twenty percent used outside agencies to some extent for all three--continuous tone photography, film processing, and enlargements/reductions. Over thirty-five percent of the firms use black and white film for their continuous tone photography. Most of these indicate "maximum usage"; hence, the mean response value was almost 1.00.

Operations within the "reproduction photography" section of the graphic arts firms which received some usage in more than twenty percent of the firms were: line photography, contacting, halftone photography, paper positives, multiple color special effects, and tray processing.

All operations except special effects also received a mean response value above 0.67. The densitometer readings of halftone work and automatic film processing operations were not used by a large number of respondents; however, more than ten percent of the respondents did indicate "maximum usage" of these two operations.

More than twenty percent of the responding firms checked all specific operations listed in the "stripping" and "proofing" sections of the survey: positive stripping, negative stripping on unprinted making sheets, negative stripping on ruled masking sheets, line proofs, and color proofs. All also received mean response values of over 0.67.

None of the operations in the "relief, intaglio, and stencil printing plate" sections was used by twenty percent of the respondents. In the planography plate section the following operations were practiced by at least twenty percent of the respondents: direct image masters, photo-direct plates, and presensitized plates--both positive working and negative working. The last three received mean response values in excess of 0.67. In addition, although neither was used by twenty percent of all respondents, electrostatic platemaking and electrostatic platemaking tied into automated offset received "maximum usage" by more than ten percent of the firms.

Most of the operations suggested in the "finishing and binding" section were used by at least twenty percent of the responding firms and received a mean response value of more than 0.67. The following operations met both of these criteria: hand and machine folding, manual trimming, punching, scoring, numbering, perforating, drilling, hand and machine collating, padding, hand wrapping, mechanical binding, wire stitching and stapling, mailing, stuffing, and addressing. Slitting, die cutting and laminating were also used by twenty percent of the respondents. Trimming with automatic spacing had almost twenty percent overall response and had more than ten percent "maximum usage" responses.

No operation received a mean response value between 0.89 and 0.96; hence, this served to be a natural break of some importance. A continuum of values below and above this range seemed to exist. The following nineteen listed operations received mean response values of 0.96 or above: layout and design done by plant staff; camera ready copy prepared by plant staff; black and white photography--continuous tone; line photography; halftone photography; negative stripping on printed, ruled masking sheets; line proofs; presensitized plates--negative working; machine folding; manual trimming; punching; perforating; drilling; hand collating; machine collating; padding; hand wrapping; wire stitching and stapling; and mailing. Along with the letterpress and offset press operations, the above operations were those performed most frequently in Missouri's graphic arts industries.

In Tables 84 and 85 the commercial and in-plant subgroups were examined for exceptions to the general responses found in Table 83 for the composite group. Of the percentage of non-usage in a subgroup varied from the composite group more than ten percent or if the mean response value of a subgroup varied more than 0.20 from the composite group, it was thought to be worthy of special mention here.

Layout and design done by the customer was used considerably more among the commercial firms and much less than average among the in-plant printers. The in-plant firms likewise used camera ready copy provided by the customer considerably less than the composite mean.

Table 84

USAGE OF GRAPHIC ARTS OPERATIONS BY THE COMMERCIAL SUBGROUP OF GRAPHIC ARTS FIRMS

Graphic Arts Plant Operation	No Usage		Seldom Used		Moderate Usage		Max. Usage		Mean Response Value
	0		1		2		3		
	#	%	#	%	#	%	#	%	
Layout and Design									
Layout and design done by outside agencies	73	51.3	40	28.4	26	18.4	2	1.4	0.70
Layout and design done by plant staff	41	29.1	14	9.9	32	22.7	54	38.3	1.70
Layout and design done by the customer	62	44.0*	28	19.9	35	24.8	16	11.3	1.04*
Other	135	95.7	2	1.4	1	0.7	3	2.1	0.09
Copy Preparation									
Camera ready copy provided by outside agencies	74	52.7	27	19.1	29	20.6	11	7.8	0.84
Camera ready copy prepared by plant staff	49	34.8	11	7.8	19	13.5	62	44.0	1.67
Camera ready copy provided by customer	70	49.6	25	17.7	33	23.4	13	9.2	0.92
Other	135	95.7	1	0.7	3	2.1	2	1.4	0.09
Composition									
Hand-set type	88	62.4	22	15.6	19	13.5	12	8.5	0.68
Ludlow	119	84.4	7	5.0	9	6.4	6	4.3	0.30
Monotype	134	95.0	3	2.1	2	1.4	2	1.4	0.11
Line-casting machines--manual keyboarding	99	70.2	11	7.8	13	9.2	18	12.8	0.65*
Line casting machines--tape operated	138	97.9	1	0.7	0	0.0	2	1.4	0.05
Strike-on composition--manual	117	83.0*	4	2.8	3	2.1	17	12.1	0.43*
Strike-on composition--tape operated	125	88.7	3	2.1	3	2.1	10	7.1	0.28
Photo typesetting--manual	91	64.5	4	2.8	12	8.5	34	24.1	0.92

Table 84 (continued)

	No Usage		Seldom Used		Moderate Usage		Max. Usage		Mean Response Value
	0		1		2		3		
	#	%	#	%	#	%	#	%	
Pre-printed copy (clip art & transfer letters)	77	54.6	31	22.0	23	16.3	10	7.1	0.76
Repro proofs for camera copy	83	58.9	16	11.3	18	12.8	24	17.0	0.88
Other	131	92.9	0	0.0	1	0.7	9	6.4	0.21
Imposition									
Hot type make-up	103	73.0	9	6.4	10	7.1	19	13.5	0.61
Page imposition performed at the paste-up stage	91	64.5	4	2.8	16	11.3	30	21.3	0.89
Film stripping for imposition	94	66.7	13	9.2	12	8.5	22	15.6	0.73
Step and repeat imposition	104	73.8	14	9.9	13	9.2	10	7.1	0.50
Other	139	98.6	0	0.0	0	0.0	2	1.4	0.04
Continuous Tone Photography									
Continuous tone photography done by outside agencies	113	80.1	13	9.2	9	6.4	6	4.3	0.35
Continuous tone photography done by plant staff	95	67.4	9	6.4	12	8.5	25	17.7	0.77
Continuous tone photography done by customer	109	77.3	13	9.2	13	9.2	6	4.3	0.40
Black and white	89	63.1	1	0.7	12	8.5	39	27.7	1.01
Color prints	119	84.4	10	7.1	8	5.7	4	2.8	0.27
Color transparencies	119	84.4	7	5.0	9	6.4	6	4.3	0.30
Film processed by outside agencies	115	81.6	9	6.4	6	4.3	11	7.8	0.38
Film processed by plant staff	98	69.5	1	0.7	10	7.1	32	22.7	0.83
Film processed by customer	121	85.8	14	9.9	3	2.1	3	2.1	0.21
Enlargements/reductions done by outside agencies	117	83.0	10	7.1	6	4.3	8	5.7	0.33

Table 84 (continued)

	No Usage		Seldom Used		Moderate Usage		Max. Usage		Mean Response Value
	0		1		2		3		
	#	%	#	%	#	%	#	%	
Enlargements/reductions done by plant staff	96	68.1	1	0.7	12	8.5	32	22.7	0.85
Enlargements/reductions done by customer	118	83.7	17	12.1	4	2.8	2	1.4	0.22
Duplicate transparencies for color separations done by outside agencies	116	82.3	3	2.1	7	5.0	15	10.6	0.44
Duplicate transparencies for color separations done by plant staff	132	93.6	0	0.0	3	2.1	6	4.3	0.17
Duplicate transparencies for color separations done by customer	132	93.6	7	5.0	2	1.4	0	0.0	0.08
Other	139	98.6	0	0.0	0	0.0	2	1.4	0.04
Reproduction									
Line photography	75	53.2	0	0.0	9	6.4	57	40.4	1.34
Contacting	82	58.2	9	6.4	12	8.5	38	27.0	1.04
Halftone photography	76	53.9	3	2.1	17	12.1	45	31.9	1.22
Color separation--scanning	139	98.6	0	0.0	1	0.7	1	0.7	0.04
Direct screen color separation--conventional	126	89.4	5	3.5	4	2.8	6	4.3	0.22
Indirect screen color separation--conventional	128	90.8	4	2.8	4	2.8	5	3.5	0.19
Dot etching	124	87.9	5	3.5	4	2.8	8	5.7	0.26
Densitometer readings of halftone work	116	82.3	1	0.7	6	4.3	18	12.8	0.48
Densitometer readings of color separations	122	86.5	3	2.1	5	3.5	11	7.8	0.33
Paper positives, PMT, or line prints	86	61.0	6	4.3	16	11.3	33	23.4	0.97
Multiple color special effects (duotones, posterizations, etc.)	108	76.6	13	9.2	8	5.7	12	8.5	0.46
Tray processing	96	68.1	5	3.5	7	5.0	33	23.4	0.84
Stabilization processing	116	82.3	3	2.1	10	7.1	12	8.5	0.42

Table 84 (continued)

	No Usage		Seldom Used		Moderate Usage		Max. Usage		Mean Response Value
	0		1		2		3		
	#	%	#	%	#	%	#	%	
Automatic film processing	115	81.6	1	0.7	4	2.8	21	14.9	0.51
Other	139	98.6	0	0.0	0	0.0	2	1.4	0.04
Stripping									
Positive stripping	90	63.8	15	10.6	9	6.4	27	19.1	0.81
Negative stripping on unprinted, unruled masking sheet	92	65.2	6	4.3	15	10.6	28	19.9	0.85
Negative stripping on printed, ruled masking sheet	81	57.4	6	4.3	10	7.1	44	31.2	1.12
Other	134	95.0	0	0.0	3	2.1	4	2.8	0.13
Proofing									
Line proofs	64	45.4	9	6.4	23	16.3	45	31.9	1.35*
Color proofs	103	73.0	8	5.7	10	7.1	20	14.2	0.62
Printing Plates									
Hand-set type	106	75.2	15	10.6	11	7.8	9	6.4	0.45
Monotype	139	98.6	2	1.4	0	0.0	0	0.0	0.01
Ludlow	130	92.2	3	2.1	5	3.5	3	2.1	0.16
Linotype and/or intertype slugs	113	80.1	8	5.7	9	6.4	11	7.8	0.42
Stereotype plates	137	97.2	1	0.7	2	1.4	1	0.7	0.06
Photo-polymer plates (dycril, etc.)	134	95.0	2	1.4	1	0.7	4	2.8	0.11
Duplicate plates--electroplates	136	96.5	4	2.8	1	0.7	0	0.0	0.04
Photoengravings	123	87.2	5	3.5	6	4.3	7	5.0	0.27
Letterset plates	139	97.9	1	0.7	0	0.0	2	1.4	0.05
Rubber printing plates	129	91.5	5	3.5	4	2.8	3	2.1	0.16

Table 84 (continued)

	No Usage		Seldom Used		Moderate Usage		Max. Usage		Mean Response Value
	0		1		2		3		
	#	%	#	%	#	%	#	%	
Flexography plates	138	97.9	0	0.0	0	0.0	3	2.1	0.06
Other	140	99.3	0	0.0	0	0.0	1	0.7	0.02
Planography or Lithography (Offset)									
Direct image masters	120	85.1*	9	6.4	5	3.5	7	5.0	0.28*
Photo-direct plates	123	87.2*	4	2.8	3	2.1	11	7.8	0.30*
Presensitized plates--positive working	108	76.6	1	0.7	9	6.4	23	16.3	0.62
Presensitized plates--negative working	98	69.5	1	0.7	8	5.7	34	24.1	0.84
Wipe-on coating	118	83.7	4	2.8	6	4.3	13	9.2	0.39
Deep-etch plates (bi-metal, tri-metal, etc.)	133	94.3	3	2.1	4	2.8	1	0.7	0.10
Stone	139	98.6	1	0.7	0	0.0	1	0.7	0.03
Electrostatic platemaking	135	95.7*	0	0.0	1	0.7	5	3.5	0.11*
Electrostatic platemaking with enlarging & reduction	138	97.9	1	0.7	1	0.7	1	0.7	0.04*
Electrostatic platemaking tied into automated offset	137	97.2*	0	0.0	1	0.7	3	2.1	0.07*
Spirit master (ditto, etc.)	140	99.3	1	0.7	0	0.0	0	0.0	0.01
Other	140	99.3	0	0.0	1	0.7	0	0.0	0.01
Intaglio (gravure)									
Gravure cylinders	141	100.0	0	0.0	0	0.0	0	0.0	0.00
Engraved plates	137	97.2	0	0.0	2	1.4	2	1.4	0.07
Other	141	100.0	0	0.0	0	0.0	0	0.0	0.00
Stencil									
Hand cut films	131	92.9	1	0.7	4	2.8	5	3.5	0.17

Table 84 (continued)

	No Usage		Seldom Used		Moderate Usage		Max. Usage		Mean Response Value
	0		1		2		3		
	#	%	#	%	#	%	#	%	
Paper stencils	135	95.7	2	1.4	2	1.4	2	1.4	0.09
Tusche stencils	139	98.6	2	1.4	0	0.0	0	0.0	0.01
Indirect photographic stencils	132	93.6	4	2.8	2	1.4	3	2.1	0.12
Direct photographic stencil emulsion	130	92.2	5	3.5	1	0.7	5	3.5	0.16
Mimeograph stencils	139	98.6	2	1.4	0	0.0	0	0.0	0.01
Other	141	100.0	0	0.0	0	0.0	0	0.0	0.00
Finishing and Binding									
Folding, hand	77	54.6	36	25.5	19	13.5	9	6.4	0.72
Folding, machine	68	48.2*	3	2.1	18	12.8	52	36.9	1.38*
Trimming, manual	80	56.7	7	5.0	19	13.5	35	24.8	1.06
Trimming, auto spacing	113	80.1	0	0.0	6	4.3	22	15.6	0.55
Slitting	105	74.5	13	9.2	13	9.2	10	7.1	0.49
Die cutting	97	68.8	16	11.3	13	9.2	15	10.6	0.62
Punching	69	48.9	21	14.9	29	20.6	22	15.6	1.03
Scoring	75	53.2	17	12.1	32	22.7	17	12.1	0.94
Embossing	119	84.4	9	6.4	6	4.3	7	5.0	0.30
Numbering	71	50.4	15	10.6	28	19.9	27	19.1	1.08
Perforating	60	42.6	17	12.1	37	26.2	27	19.1	1.22
Drilling	77	54.6	14	9.9	24	17.0	26	18.4	0.99
Collating, hand	67	47.5	12	8.5	33	23.4	29	20.6	1.17
Collating, machine	111	78.7*	4	2.8	12	8.5	14	9.9	0.50*
Foil stamping	129	91.5	4	2.8	3	2.1	5	3.5	0.18
Tipping	116	82.3	7	5.0	11	7.8	7	5.0	0.35

Table 84 (continued)

	No Usage		Seldom Used		Moderate Usage		Max. Usage		Mean Response Value
	0		1		2		3		
	#	%	#	%	#	%	#	%	
Padding	64	45.4*	7	5.0	33	23.4	37	26.2	1.30*
Laminating	125	88.7	7	5.0	3	2.1	6	4.3	0.22
Wrapping, hand	64	45.4	6	4.3	24	17.0	47	33.3	1.38
Wrapping, shrink	119	84.4	3	2.1	7	5.0	12	8.5	0.38
Mechanical binding (metal, plastic, etc.)	111	78.7*	8	5.7	12	8.5	10	7.1	0.44*
Perfect binding	131	92.9	6	4.3	4	2.8	0	0.0	0.10
Wire stitching and stapling	68	48.2	12	8.5	29	20.6	32	22.7	1.18
Case binding of books	129	91.5	5	3.5	4	2.8	3	2.1	0.16
Mailing	95	67.4*	9	6.4	20	14.2	17	12.1	0.71*
Stuffing	96	68.1	19	13.5	14	9.9	12	8.5	0.59
Addressing	96	68.1	14	9.9	14	9.9	17	12.1	0.66*
Other	136	96.5	0	0.0	3	2.1	2	1.4	0.09

*Percentage of non-usage varied from the composite group percentage more than ten percent or the mean response value varied from the composite group value more than 0.20.

Table 85

USAGE OF GRAPHIC ARTS OPERATIONS BY THE IN-PLANT SUBGROUP OF GRAPHIC ARTS FIRMS

Graphic Arts Plant Operation	No Usage		Seldom Used		Moderate Usage		Max. Usage		Mean Response Value
	0		1		2		3		
	#	%	#	%	#	%	#	%	
Layout and Design									
Layout and design done by outside agencies	40	44.0	28	30.8	13	14.3	10	11.0	0.92
Layout and design done by plant staff	23	25.3	8	8.8	21	23.1	39	42.9	1.84
Layout and design done by the customer	64	70.3*	15	16.5	9	9.9	3	3.3	0.46*
Other	87	95.6	0	0.0	1	1.1	3	3.3	0.12
Copy Preparation									
Camera ready copy provided by outside agencies	53	58.2	20	22.0	12	13.2	6	6.6	0.68
Camera ready copy prepared by plant staff	24	26.4	3	3.3	15	16.5	49	53.8	1.98
Camera ready copy provided by customer	65	71.4*	15	16.5	7	7.7	4	4.4	0.45*
Other	86	94.5	0	0.0	0	0.0	5	5.5	0.16
Composition									
Hand-set type	75	82.4*	9	9.9	7	7.7	0	0.0	0.25*
Ludlow	86	94.5	1	1.1	2	2.2	2	2.2	0.12
Monotype	91	100.0	0	0.0	0	0.0	0	0.0	0.00
Line-casting machines--manual keyboarding	85	93.4*	2	2.2	4	4.4	0	0.0	0.11*
Line casting machines--tape operated	88	96.7	0	0.0	2	2.2	1	1.1	0.08
Strike-on composition--manual	52	57.1*	8	8.8	10	11.0	21	23.1	1.00*
Strike-on composition--tape operated	77	84.6	1	1.1	7	7.7	6	6.6	0.36
Photo typesetting--manual	60	65.9	7	7.7	10	11.0	14	15.4	0.76

Table 85 (continued)

	No Usage		Seldom Used		Moderate Usage		Max. Usage		Mean Response Value
	0		1		2		3		
	#	%	#	%	#	%	#	%	
Pre-printed copy (clip art & transfer letters)	48	52.7	15	16.5	17	18.7	11	12.1	0.90
Repro proofs for camera copy	67	73.6	5	5.5	18	19.8	1	1.1	0.48*
Other	85	93.4	1	1.1	0	0.0	5	5.5	0.18
Imposition									
Hot type make-up	85	93.4*	1	1.1	5	5.5	0	0.0	0.12*
Page imposition performed at the paste-up stage	67	73.6	1	1.1	6	6.6	17	18.7	0.70
Film stripping for imposition	73	80.2	4	4.4	7	7.7	7	7.7	0.43
Step and repeat imposition	80	87.9	4	4.4	5	5.5	2	2.2	0.22
Other	91	100.0	0	0.0	0	0.0	0	0.0	0.00
Continuous Tone Photography									
Continuous tone photography done by outside agencies	69	75.8	12	13.2	5	5.5	5	5.5	0.41
Continuous tone photography done by plant staff	68	74.7	1	1.1	7	7.7	15	16.5	0.66
Continuous tone photography done by customer	82	90.1	5	5.5	2	2.2	2	2.2	0.13
Black and white	61	67.0	1	1.1	7	7.7	22	24.2	0.89
Color prints	76	83.5	4	4.4	5	5.5	6	6.6	0.35
Color transparencies	75	82.4	7	7.7	3	3.3	6	6.6	0.34
Film processed by outside agencies	71	78.0	8	8.8	5	5.5	7	7.7	0.43
Film processed by plant staff	71	78.0	1	1.1	5	5.5	14	15.4	0.58
Film processed by customer	82	90.1	9	9.9	0	0.0	0	0.0	0.10
Enlargements/reductions done by outside agencies	70	76.9	8	8.8	6	6.6	7	7.7	0.45

Table 85 (continued)

	No Usage		Seldom Used		Moderate Usage		Max. Usage		Mean Response Value
	0		1		2		3		
	#	%	#	%	#	%	#	%	
Enlargements/reductions done by plant staff	66	72.5	1	1.1	7	7.7	17	18.7	0.73
Enlargements/reductions done by customer	84	92.3	5	5.5	2	2.2	0	0.0	0.10
Duplicate transparencies for color separations done by outside agencies	79	86.8	7	7.7	3	3.3	2	2.2	0.21
Duplicate transparencies for color separations done by plant staff	87	95.6	1	1.1	1	1.1	2	2.2	0.10
Duplicate transparencies for color separations done by customer	89	97.8	2	2.2	0	0.0	0	0.0	0.02
Other	90	98.9	0	0.0	0	0.0	1	1.1	0.03
Reproduction									
Line photography	55	60.4	0	0.0	8	8.8	28	30.8	1.10
Contacting	68	74.7*	6	6.6	6	6.6	11	12.1	0.56*
Halftone photography	57	62.6	6	6.6	14	15.4	14	15.4	0.84*
Color separation--scanning	85	93.4	2	2.2	2	2.2	2	2.2	0.13
Direct screen color separation--conventional	82	90.1	2	2.2	3	3.3	4	4.4	0.22
Indirect screen color separation--conventional	87	95.6	2	2.2	0	0.0	2	2.2	0.09
Dot etching	87	95.6	3	3.3	0	0.0	1	1.1	0.07
Densitometer readings of halftone work	79	86.8	2	2.2	3	3.3	7	7.7	0.32
Densitometer readings of color separations	83	91.2	3	3.3	3	3.3	2	2.2	0.16
Paper positives, PMT, or line prints	67	73.6	2	2.2	10	11.0	12	13.2	0.64*
Multiple color special effects (duotones, posterizations, etc.)	70	76.9	7	7.7	10	11.0	4	4.4	0.43
Tray processing	68	74.7	3	3.3	3	3.3	17	18.7	0.66
Stabilization processing	79	86.8	1	1.1	5	5.5	6	6.6	0.32

Table 85 (continued)

	No Usage		Seldom Used		Moderate Usage		Max. Usage		Mean Response Value
	0		1		2		3		
	#	%	#	%	#	%	#	%	
Automatic film processing	80	87.9	1	1.1	2	2.2	8	8.8	0.32
Other	90	98.9	0	0.0	0	0.0	1	1.1	0.03
Stripping									
Positive stripping	67	73.6	7	7.7	5	5.5	12	13.2	0.58
Negative stripping on unprinted, unruled masking sheet	65	71.4	8	8.8	9	9.9	9	9.9	0.58
Negative stripping on printed, ruled masking sheet	45	49.5	3	3.3	14	15.4	29	31.9	1.30
Other	88	96.7	1	1.1	0	0.0	2	2.2	0.08
Proofing									
Line proofs	59	64.8*	6	6.6	14	15.4	12	13.2	0.77*
Color proofs	77	84.6	3	3.3	4	4.4	7	7.7	0.35
Printing Plates									
Hand-set type	84	92.3*	3	3.3	3	3.3	1	1.1	0.13*
Monotype	90	98.9	1	1.1	0	0.0	0	0.0	0.01
Ludlow	86	94.5	0	0.0	3	3.3	2	2.2	0.13
Linotype and/or Intertype slugs	87	95.6	2	2.2	0	0.0	2	2.2	0.09*
Stereotype plates	90	98.9	1	1.0	0	0.0	0	0.0	0.01
Photo-polymer plates (dycril, etc.)	87	95.6	0	0.0	2	2.2	2	2.2	0.11
Duplicate plates--electroplates	81	89.0	0	0.0	4	4.4	6	6.6	0.29
Photoengravings	88	96.7	0	0.0	2	2.2	1	1.1	0.08
Letterset	89	97.8	0	0.0	2	2.2	0	0.0	0.04
Rubber printing plates	87	95.6	1	1.1	2	2.2	1	1.1	0.09
Flexography plates	90	98.9	0	0.0	1	1.1	0	0.0	0.02

Table 85 (continued)

	No Usage		Seldom Used		Moderate Usage		Max. Usage		Mean Response Value
	0		1		2		3		
	#	%	#	%	#	%	#	%	
Other	89	97.8	0	0.0	0	0.0	2	2.2	0.07
Planography or Lithography (Offset)									
Direct image masters	45	49.5*	12	13.2	14	15.4	20	22.0	1.10*
Photo-direct plates	46	50.5*	7	7.7	10	11.0	28	30.8	1.22*
Presensitized plates--positive working	61	67.0	2	2.2	14	15.4	14	15.4	0.79
Presensitized plates--negative working	48	52.7*	4	4.4	11	12.1	28	30.8	1.21*
Wipe-on coating	79	86.8	1	1.1	2	2.2	9	9.9	0.35
Deep-etch plates (bi-metal, tri-metal, etc.)	86	94.5	3	3.3	1	1.1	1	1.1	0.09
Stone	90	98.9	0	0.0	0	0.0	1	1.1	0.03
Electrostatic platemaking	55	60.4*	4	4.4	5	5.5	27	29.7	1.04*
Electrostatic platemaking with enlarging & reduction	67	73.6*	4	4.4	7	7.7	13	14.3	0.63*
Electrostatic platemaking tied into automated offset	61	67.0*	1	1.1	1	1.1	28	30.8	0.96*
Spirit master (ditto, etc.)	71	78.0*	13	14.3	5	5.5	2	2.2	0.32
Other	89	97.8	2	2.2	0	0.0	0	0.0	0.02
Intaglio (Gravure)									
Gravure cylinders	90	98.9	0	0.0	0	0.0	1	1.1	0.03
Engraved plates	90	98.9	0	0.0	0	0.0	1	1.1	0.03
Other	91	100.0	0	0.0	0	0.0	0	0.0	0.00
Stencil									
Hand cut films	87	95.6	1	1.1	3	3.3	0	0.0	0.08
Paper stencils	87	95.6	1	1.1	2	2.2	1	1.1	0.09
Tusche stencils	90	98.9	1	1.1	0	0.0	0	0.0	0.01

Table 85 (continued)

	No Usage		Seldom Used		Moderate Usage		Max. Usage		Mean Response Value
	0		1		2		3		
	#	%	#	%	#	%	#	%	
Indirect photographic stencils	88	96.7	1	1.1	0	0.0	2	2.2	0.08
Direct photographic stencil emulsion	87	95.6	1	1.1	2	2.2	1	1.1	0.09
Mimeograph stencils	81	89.0	3	3.3	4	4.4	3	3.3	0.22
Other	90	98.9	0	0.0	1	1.1	0	0.0	0.02
Finishing and Binding									
Folding, hand	42	46.2	29	31.9	17	18.7	3	3.3	0.79
Folding, machine	17	18.7*	5	5.5	30	33.0	39	42.9	2.00*
Trimming, manual	31	34.1*	14	15.4	24	26.4	22	24.2	1.41*
Trimming, auto spacing	74	81.3	3	3.3	5	5.5	9	9.9	0.44
Slitting	69	75.8	9	9.9	7	7.7	6	6.6	0.45
Die cutting	78	85.7*	3	3.3	8	8.8	2	2.2	0.27*
Punching	31	34.1	7	7.7	27	29.7	26	28.6	1.53*
Scoring	50	54.9	17	18.7	16	17.6	8	8.8	0.80
Embossing	84	92.3	2	2.2	3	3.3	2	2.2	0.15
Numbering	61	67.0*	13	14.3	10	11.0	7	7.7	0.59*
Perforating	43	47.3	18	19.8	24	26.4	6	6.6	0.92
Drilling	28	30.8*	12	13.2	31	34.1	20	22.0	1.47*
Collating, hand	32	35.2	15	16.5	28	30.8	16	17.6	1.31
Collating, machine	28	30.8*	6	6.6	17	18.7	40	44.0	1.76*
Foil stamping	80	87.9	5	5.5	5	5.5	1	1.1	0.20
Tipping	83	91.2	1	1.1	2	2.2	5	5.5	0.22
Padding	17	18.7*	11	12.1	25	27.5	38	41.8	1.92*
Laminating	60	65.9*	20	22.0	10	11.0	1	1.1	0.47
Wrapping, hand	39	42.9	13	14.3	22	24.2	17	18.7	1.19

Table 85 (continued)

	No Usage		Seldom Used		Moderate Usage		Max. Usage		Mean Response
	0		1		2		3		Value
	#	%	#	%	#	%	#	%	
Wrapping, shrink	72	79.1	2	2.2	8	8.8	9	9.9	0.49
Mechanical binding (metal, plastic, etc.)	36	39.6*	15	16.5	29	31.9	11	12.1	1.16*
Perfect binding	82	90.1	2	2.2	2	2.2	5	5.5	0.23
Wire stitching and stapling	33	36.3	10	11.0	22	24.2	26	28.6	1.45
Case binding of books	82	90.1	2	2.2	5	5.5	2	2.2	0.20
Mailing	36	39.6*	5	5.5	17	18.7	33	36.3	1.52*
Stuffing	47	51.6*	11	12.1	13	14.3	20	22.0	1.07*
Addressing	48	52.7	3	3.3	15	16.5	25	27.5	1.19*
Other	88	96.7	1	1.1	0	0.0	2	2.2	0.08

*Percentage of non-usage varied from the composite group percentage more than ten percent or the mean response value varied from the composite group value more than 0.20.

Hand-set type, line-casting machines (manual keyboarding), and repro proofs for camera copy were used considerably less and manual strike-on composition was used considerably more by in-plant firms. Manual keyboarding of line-casting machines was used more than average and manual strike-on composition was used less than average by commercial firms. Hot type imposition was used much less than average by in-plant firms.

Contacting, halftone photography, paper positives, and line proofing were used less by in-plant firms and line proofs were used more by commercial printers than the composite mean. Hand-set type and linotype slugs were used very little among in-plant printers.

In-plant printers made greater use and commercial firms made lesser use than average of direct image masters and photo-direct plates as well as electrostatic platemaking (regular, with enlarging and reduction, and tied with automated offset). The in-plant firms also used negative working presensitized plates more than average.

The in-plant firms used the following operations more than average: machine folding, manual trimming, punching, drilling, machine collating, padding, mechanical binding, mailing, stuffing, and addressing. In-plant firms used die cutting and numbering less than average, while commercial firms used machine folding, machine collating, padding, mechanical binding, mailing and addressing less than average.

Presses and Materials

In this section of the study respondents were asked to write in the number of presses they used of various types and sizes listed. They were also asked to check the substrates used in their firms. The responses show that in the state of Missouri few graphic arts firms use more than three of a type or size of press.

Among the relief press users most employed sheet-fed platen (77 firms) or sheet-fed cylinder (38 firms) presses for their work. No more than four firms used any other type of relief press. These data are shown in Table 86.

Table 87 shows that among users of lithographic presses the mean number of presses per firm was even lower than for relief press users. However, more firms used the various types of presses, with 115 firms using the sheet-fed 14" x 20" standard offset press or duplicator and 35 firms using the automated model of the same size. Forty-three firms used sheet-fed presses ranging from 17x22 to 22x30. Fewer than twenty firms used other types of single- or multi-color presses.

A dozen firms used hand-fed, hand-squeege screen presses and six used similar presses with auto-squeege. The mean number of screen presses per firm was most often less than four. The intaglio area received no response regarding the type of presses used in Missouri. These data are shown in Table 88.

As might be expected, Table 89 shows that most firms used only paper as a substrate. Foil, plastic, and textiles were also used by a few firms using planographic and relief methods. Each of the substrates listed was used by at least one company in Missouri for screen printing.

Competencies

In this section of the study respondents were asked to list for each of 16 production areas those skills, knowledges, attitudes, and other experiences which they would consider essential for a graduate of a vocational-technical high school program who applied for a position

Table 86

NUMBER OF GRAPHIC ARTS FIRMS USING VARIOUS TYPES OF RELIEF PRESSES

	Letterpress				Flexography				Letterset			
	Sheet		Web		Sheet		Web		Sheet		Web	
Type of Press	Firms	Mean/Firm	Firms	Mean/Firm	Firms	Mean/Firm	Firms	Mean/Firm	Firms	Mean/Firm	Firms	Mean/Firm
Platen	77	2.04[b]	2	3.00	0	0.00	1	2.00	0	0.00	0	0.00
Cylinder	38	2.03[b]	1	1.00	1	1.00	1	3.00	4	7.75[a]	0	0.00
Rotary	4	3.33[b]	0	0.00			2	2.00			1	b

a. The mean was influenced greatly by one firm with 23 presses.

b. In cases where some firms may have responded only by checking a category, the mean for that category is based upon those respondents indicating the number of presses used. The mean was omitted if all respondents in that category failed to indicate the number of presses.

Table 87

NUMBER OF GRAPHIC ARTS FIRMS USING VARIOUS TYPES OF LITHOGRAPHIC PRESSES

Type of Lithographic Press	Single Color		Multi Color	
	Firms	Mean/Firm	Firms	Mean/Firm
Sheet				
14"x20" and smaller, standard	115	2.37[a]	15	1.31[a]
14"x20" and smaller, automated	35	1.77[a]	4	1.33[a]
17"x22" to 22"x30"	43	1.57[a]	6	1.33
22"x34" and larger	18	1.18[a]	13	2.58[a]
Web				
up to 14" wide	7	1.00[a]	3	2.00[a]
14" to 38" wide	7	1.60[a]	6	1.00[a]
over 38" wide	1	30.00	3	12.00[a][b]
Metal Decorating Press	1	3.00	0	0.00

a. In cases where some firms may have responded only by checking a category, the mean for that category is based upon those respondents indicating the number of presses used.

b. The mean was influenced greatly by one firm with 18 presses.

Table 88

NUMBER OF GRAPHIC ARTS FIRMS USING VARIOUS TYPES OF SCREEN AND INTAGLIO PRESSES

Type of Press	Single Color		Multi Color	
	Firms	Mean/Firm	Firms	Mean/Firm
Screen				
Hand Fed				
Hand Squeege	12	3.33[a]	1	a
Auto Squeege	6	2.67	0	0.00
Auto Fed	1	2.00	0	0.00
Intaglio				
Sheet Gravure	0	0.00	0	0.00
Rotogravure	0	0.00	0	0.00
Engraving	0	0.00	0	0.00

a. In cases where some firms may have responded only by checking a category, the mean for that category is based upon those respondents who indicated the number of presses used. The mean was omitted if all respondents in that category failed to indicate the number of presses.

Table 89

NUMBER OF GRAPHIC ARTS FIRMS USING VARIOUS SUBSTRATES WITH GIVEN TRANSFER METHODS

	Types of Substrate									
Transfer Method	paper	plastic	foil	textiles	metal	wood	leather	cylinders	glass	other
Planography										
Lithography	134	10	8	4	1	0	1	1	0	1
Relief										
Letterpress	57	6	5	4	0	0	1	1	0	1
Flexography	6	4	2	0	0	0	0	0	0	0
Letterset	7	1	0	0	0	0	0	0	0	0
Intaglio										
Gravure	0	0	0	0	0	0	0	0	0	0
Engraving	2	1	1	1	0	0	0	0	0	0
Stencil										
Screen	17	10	6	5	7	6	3	1	2	3

with their company in that one area of graphic arts. The responses were then grouped under three main categories: (1) physical and natural capabilities, (2) personal qualities, and (3) knowledge, skills and experiences. Under these three main categories, similar responses were grouped into 67 subgroups or competencies. In grouping, an attempt was made to generalize the competencies in order to keep the total list to a manageable size; hence, the competencies listed may not be mutually exclusive.

The following competencies and corresponding code numbers were used for this portion of the study.

Physical and Natural Capabilities

1. Good Health
2. Intelligence, able to learn
3. Good Vision
4. Mechanical Aptitude
5. Manual Dexterity, able to work with speed
6. Pleasing Physical Appearance
7. Analytical Mind
8. Visualize in Three-dimensions
9. Good Memory

Personal Qualities

21. Neatness, Cleanliness
22. Initiative, enthusiasm, desire, pride, hard work, desire to learn, aggressive
23. Dependable, punctual, meets schedules
24. Makes decisions, common sense, thinks under pressure
25. Creativity, imagination, ingenuity

26. Flexibility, adaptability, openmindedness, accept constructive criticism

27. Communicates, cooperation, follow instructions, listen

28. Precision, accuracy, patience, concentration, work with details

29. Overall good attitude, friendly, cheerful, meets people well

30. Honest

31. Loyalty, company-minded

32. Quality awareness

33. Safety conscious

34. Willing to do monotonous jobs

Knowledge, Skills, and Experiences

51. Know and apply principles of art and design

52. Know and apply photographic principles (including enlarging and reducing, halftones, line work, filters, developing)

53. Know products and processes in print shop

54. Know and use basic processes and equipment common to this area

55. Have basic general understanding

56. Know and apply principles of rendering layouts

57. Ability to letter

58. Know and apply principles of color

59. Make paste-ups or mechanicals from layouts

60. Strip flats (masking, step and repeat, double burn)

61. Know binding processes and uses

62. Measure using printer's terminology

63. Spell well

64. Know structure of English language

65. Know type faces and uses; rules and borders

66. Know forms layout, standard sizes

67. Ability to touch-type at reasonable speed

68. Ability to fit and mark copy

69. Know basic computer capabilities and terminology

70. Work experience in related, practical jobs

71. Creative or technical writing

72. Know and apply principles of selling

73. Coordinate people and materials

74. Know and apply operation of machines frequently used in that area

75. Figure and calculate by hand and/or calculator

76. Have college degree

77. Ink and paper (substrates) characteristics

78. Know details of photography (films, equipment, densitometry)

79. Know details of platemaking (coating, exposure, development, types of plates)

80. Accounting skill (bookkeeping, cost accounting)

81. Do set ups and preventative maintenance on machines

82. Ability to find errors

83. Ability to speak, public speaking

84. Fast reader

85. Fast evaluation of client needs

86. Know and apply proofreading marks

87. Quality control procedures

88. Know related government regulations

89. Know principles of estimating

90. Color photo prints and transparency duplication

91. Know specific proofing systems

92. Know time study methods

93. Research and revise

94. Maintain a portfolio
99. Union designated

A total of 2112 competencies were mentioned by the responding firms. Of these 224 (10.61 percent) were related to physical and natural capabilities, 685 (32.44 percent) were related to personal qualities, and 1203 (56.96 percent) were related to knowledges, skills, or experiences. Table 90 shows the distribution of competencies required for the various graphic arts areas.

Overall there were a number of competencies which were mentioned by at least two percent of the respondents and could be considered as general competencies needed by most all graphic arts employees. Then within each production area, those competencies mentioned by at least five percent of the respondents in that area were considered as necessary for that area.

Those physical competencies, personal qualities, skills, knowledges, or experiences desired by at least two percent of all respondents were: mechanical aptitude, manual dexterity, neatness, initiative, ability to communicate, precision, overall good attitude, art and design principles, photographic principles, products and processes of printing, processes and equipment common to specific area of employment, basic general understanding, structure of English language, practical work experience, and operation of machines frequently used in area of employment.

Within the specific areas, Table 91 shows the competencies mentioned by at least five percent of the responses as being necessary for employment in that area. In the area of layout and design, the competencies were ranked in this order: know and apply principles of art and

Table 90

DISTRIBUTION OF GRAPHIC ARTS FIRMS DESIRING SPECIFIC COMPETENCIES OF VOCATIONAL SCHOOL GRADUATES DESIRING PLACEMENT BY PRODUCTION AREA

Competency	Layout and Design	Copy Preparation	Composition	Continuous Tone Photography	Reproduction Photography	Stripping	Proofing	Platemaking	Presswork	Finishing	Binding	Estimating	Production Supervision	Sales	Fast Copy Center	Other	Frequency of Response	
																	#	%
1	1	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	6	0.28
2	3	3	2	2	2	5	2	4	2	2	2	2	4	3	0	0	38	1.80
3	1	0	0	0	1	4	3	1	2	0	0	0	0	0	0	0	12	0.57
4	3	1	3	1	2	1	1	1	14	8	7	1	2	1	1	1	48	2.27*
5	6	6	17	3	5	9	7	7	9	6	14	4	2	1	8	0	104	4.92*
6	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0.09
7	3	2	0	0	0	1	0	0	1	0	0	3	1	1	0	0	12	0.56
8	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0.05
9	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.05
10	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.09

Table 90 (continued)

Competency	Layout and Design	Copy Preparation	Composition	Continuous Tone Photography	Reproduction Photography	Stripping	Proofing	Platemaking	Presswork	Finishing	Binding	Estimating	Production Supervision	Sales	Fast Copy Center	Other	Frequency of Response #	Frequency of Response %
21	9	11	7	3	3	6	2	5	12	2	7	0	0	2	3	0	72	3.36*
22	14	11	10	7	9	6	8	10	17	7	9	6	10	17	4	3	148	7.01*
23	4	2	2	1	3	2	2	3	5	1	2	1	1	2	2	0	33	1.56
24	8	3	3	1	2	3	3	2	4	0	1	2	2	4	2	1	41	1.94
25	13	4	0	2	1	1	0	0	1	0	0	1	1	1	0	0	25	1.18
26	5	3	4	1	3	3	2	3	3	0	0	2	1	1	0	1	32	1.52
27	14	8	8	2	5	7	4	6	11	8	5	6	6	4	3	5	102	4.83*
28	8	8	10	4	6	11	9	7	10	4	5	8	2	0	5	0	97	4.59*
29	7	5	7	3	5	9	5	7	14	6	9	3	7	13	4	3	107	5.07*
30	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	3	0.14
31	2	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1	5	0.24
32	1	1	0	0	1	0	0	2	5	2	2	0	1	0	1	0	16	0.76
33	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0.05
34	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	3	0.14

Table 90 (continued)

Competency	Layout and Design	Copy Preparation	Composition	Continuous Tone Photography	Reproduction Photography	Stripping	Proofing	Platemaking	Presswork	Finishing	Binding	Estimating	Production Supervision	Sales	Fast Copy Center	Other	Frequency of Response #	Frequency of Response %
51	38	14	8	3	4	7	2	3	5	1	1	0	2	3	0	0	91	4.31*
52	7	3	3	20	25	3	4	2	1	1	1	0	0	0	1	0	71	3.36*
53	18	7	4	1	2	8	5	7	13	8	7	24	32	19	2	2	159	7.53*
54	20	18	14	1	6	12	10	27	7	10	11	3	4	4	6	0	153	7.24*
55	14	11	5	2	2	9	7	12	7	6	6	0	1	1	1	0	84	3.98*
56	15	0	0	0	1	1	1	1	1	0	0	1	0	0	0	0	21	0.99
57	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0.19
58	3	1	0	0	2	1	2	1	2	0	0	0	0	0	0	0	12	0.57
59	5	10	0	0	0	2	0	1	0	0	0	0	0	0	0	0	18	0.85
60	2	2	0	0	0	16	1	0	0	0	0	0	0	0	0	0	21	0.99
61	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	3	0.14
62	3	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0.38
63	2	6	8	0	0	0	8	0	0	0	0	1	2	1	1	1	30	1.42
64	2	11	11	1	2	2	6	2	2	2	2	1	3	1	1	1	50	2.37*
65	13	11	7	0	0	0	0	0	0	0	0	0	0	0	0	0	31	1.47

Table 90 (continued)

Competency	Layout and Design	Copy Preparation	Composition	Continuous Tone Photography	Reproduction Photography	Stripping	Proofing	Platemaking	Presswork	Finishing	Binding	Estimating	Production Supervision	Sales	Fast Copy Center	Other	Frequency of Response #	Frequency of Response %
66	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0.19
67	2	8	22	0	0	0	0	0	0	0	0	0	0	1	0	1	34	1.61
68	2	3	2	0	0	0	1	0	0	0	0	0	0	0	0	0	8	0.38
69	1	0	3	0	0	0	0	0	0	0	0	0	1	0	0	0	5	0.24
70	5	4	3	3	3	6	3	6	9	4	5	11	23	5	2	0	92	4.36*
71	0	4	0	0	0	0	0	0	0	0	0	0	0	1	0	0	5	0.24
72	0	0	0	0	0	0	0	0	0	0	0	1	0	7	0	1	9	0.43
73	0	0	0	0	0	0	0	0	0	1	0	1	22	0	0	0	24	1.14
74	1	2	22	1	1	2	1	4	43	12	14	3	5	0	10	0	121	5.73*
75	1	2	2	1	1	1	1	0	1	0	1	14	3	1	0	0	29	1.37
76	0	0	0	1	0	0	0	0	0	0	0	3	2	4	0	0	10	0.47
77	3	1	0	0	0	0	1	0	10	0	0	6	4	1	0	1	27	1.28
78	1	1	0	2	8	3	0	0	0	0	0	0	0	0	0	0	15	0.71
79	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	11	0.52
80	0	0	0	0	0	0	0	0	0	0	0	4	2	0	0	1	7	0.33

Table 90 (continued)

Competency	Layout and Design	Copy Preparation	Composition	Continuous Tone Photography	Reproduction Photography	Stripping	Proofing	Platemaking	Presswork	Finishing	Binding	Estimating	Production Supervision	Sales	Fast Copy Center	Other	Frequency of Response #	Frequency of Response %
81	0	0	0	0	0	0	0	2	9	0	0	0	0	0	0	0	11	0.52
82	1	0	3	0	0	0	2	0	0	0	0	0	0	0	0	0	6	0.28
83	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	3	0.14
84	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0.05
85	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	2	0.09
86	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	3	0.14
87	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	2	0.09
88	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0.05
89	0	0	0	0	0	0	0	0	0	0	0	3	1	1	0	0	5	0.24
90	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.05
91	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0.05
92	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0.05
93	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.05
94	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.09

Table 90 (continued)

Competency	Layout and Design	Copy Preparation	Composition	Continuous Tone Photography	Reproduction Photography	Stripping	Proofing	Platemaking	Presswork	Finishing	Binding	Estimating	Production Supervision	Sales	Fast Copy Center	Other	Frequency of Response #	Frequency of Response %
99	0	0	0	1	1	1	1	1	0	0	0	1	0	0	0	0	6	0.28
Total	269	193	197	69	107	144	108	139	225	92	114	118	148	108	57	24	2112	100.00**
Percentage	12.74	9.14	9.33	3.27	5.07	6.82	5.11	6.58	10.65	4.36	5.40	5.59	7.01	5.11	2.70	1.14		

*Competencies mentioned by at least two percent of all respondents.

**Totals may not equal to 100 percent due to rounding.

Table 91

RANKING OF COMPETENCIES DESIRED BY AT LEAST FIVE PERCENT OF RESPONDING GRAPHIC ARTS FIRMS BY PRODUCTION AREA

Competency	Layout & Design		Copy Preparation		Composition		Cont. Tone Photography		Reproduction Photography		Stripping		Proofing		Platemaking		Presswork		Finishing		Binding		Estimating		Production Supervision		Sales		Fast Copy Center		Other	
	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank
Mechanical Aptitude																	14	3.5	8	4	7	7										
Manual Dexterity					17	3					9	5	7	5.5	7	6.5			6	8	14	1.5							6	2		
Neatness			11	5													12	6			7	7							3	7.5		
Initiative	14	6	11	5	10	6.5	7	2	9	2			8	3.5	10	4	17	2	7	6	9	4.5	6	6	10	4	17	2	4	5.5	3	2.5
Ability to Communicate	14	6																	8	4			6	6					3	7.5	5	1
Precision					10	6.5	4	3	6	4.5	11	3	9	2	7	6.5							8	4					5	4		
Good Overall Attitude											9	5			7	6.5	14	3.5	6	8	9	4.5					13	3	4	5.5	3	2.5
Know & Apply Prin. of Art & Design	38	1	14	2																												
Know & Apply Prin. of Phot.							20	1	25	1																						
Know Prod. & Proc. of Print Shop	18	3									8	7			7	6.5	13	5	8	4	7	7	24	1	32	1	19	1			2	4

Table 91 (continued)

Competency	Layout & Design		Copy Preparation		Composition		Cont. Tone Photography		Reproduction Photography		Stripping		Proofing		Platemaking		Presswork		Finishing		Binding		Estimating		Production Supervision		Sales		Fast Copy Center		Other	
	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank
Know & Use Proc. & Equip.	20	2	18	1	14	4			6	4.5	12	2	10	1	27	1			10	2	11	3							6	3		
Basic Gen. Understanding	14	6	11	5							9	5	7	5.5	12	2			6	8	6	9										
Know & Apply Prin. of Rendering & Layout	15	4																														
Make Paste-ups			10	8																												
Strip Flats											16	1																				
Spell well													8	3.5																		
Know struc. of English			11	5	11	5							6	7																		
Know type faces & uses			11	5																												
Touch-type at reasonable speed					22	1.5																										
Prac. work experience																							11	3	23	2						
Know & Apply Prin. Selling																											7	4				
Coordinate People & Mater.																									22	3						

Table 91 (continued)

Competency	Layout & Design		Copy Preparation		Composition		Cont. Tone Photography		Reproduction Photography		Stripping		Proofing		Platemaking		Presswork		Finishing		Binding		Estimating		Production Supervision		Sales		Fast Copy Center		Other	
	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank	No.	Rank
Operate Machines of Area					22	1.5											43	1	12	1	14	1.5							10	1		
Calculate by Hand or Cal.																							14	2								
Know Char. of Ink & Paper																							6	6								
Know Details of Photo.									8	3																						
Know Details of Platemak.															11	3																
No. of Competencies Ranked in this Area	7		8		7		3		5		7		7		8		6		9		9		7		4		4		8		4	

design (38 firms), know and use basic processes and equipment common to this area (20 firms), know products and processes in print shop (18 firms), know and apply principles of rendering layouts (15 firms), basic general understanding (14 firms), initiative (14 firms) and ability to communicate (14 firms).

In the area of copy preparation the competencies were ranked as follows: know and use basic processes and equipment common to this area (18 firms), know and apply principles of art and design (14 firms), neatness (11 firms), initiative (11 firms), basic general understanding (11 firms), know structure of English language (11 firms), know type faces and uses (11 firms), and make paste-up from layouts (10 firms).

The competencies in the composition area which received at least five percent of the responses in that area are in order of ranking: operate machines frequently used in that area (22 firms), touch-type at a reasonable speed (22 firms), manual dexterity (17 firms), know and use basic processes and equipment common to this area (14 firms), know structure of the English language (11 firms), initiative (10 firms), and precision (10 firms).

In the continuous tone photography area only three competencies received the necessary five percent mention--know and apply photographic principles (20 firms), initiative (7 firms), and precision (4 firms). Five competencies received the necessary responses in the reproduction photography area--know and apply photographic principles (25 firms), initiative (9 firms), know details of photography (8 firms), precision (6 firms), and know and use basic processes and equipment of this area (6 firms).

The area of stripping required the following competencies in order: strip flats (16 firms), know and use basic processes and equipment of this area (12 firms), precision (11 firms), manual dexterity (9 firms), good overall attitude (9 firms), basic general understanding (9 firms), and know products and processes in the print shop (8 firms).

The seven competencies required for proofing are: know and use basic processes and equipment common to this area (10 firms), precision (9 firms), initiative (8 firms), spell well (8 firms), basic general understanding (7 firms), manual dexterity (7 firms), and know structure of English language (6 firms).

The area of platemaking required competency in the following: know and use basic processes and equipment common to this area (27 firms), basic general understanding (12 firms), know details of platemaking (11 firms), initiative (10 firms), manual dexterity (7 firms), precision (7 firms), overall good attitude (7 firms), and know products and processes of print shop (7 firms).

The presswork area required the following six competencies: operate machines frequently used in the area (43 firms), initiative (17 firms), mechanical aptitude (14 firms), good overall attitude (14 firms), know products and processes in the print shop (13 firms), and neatness (12 firms).

The finishing area had nine competencies with at least five percent of the responses. These are: operate machines frequently used in the area (12 firms), know and use basic processes and equipment common to this area (10 firms), mechanical aptitude (8 firms), ability to communicate (8 firms), know products and processes in the print shop (8 firms), initiative (7 firms), basic general understanding (6 firms), manual dexterity (6 firms), and good overall attitude (6 firms).

Except for one change, the binding area had the same competencies required as the finishing area; however, the ranks changed. The following is the rank of the competencies required in binding: manual dexterity (14 firms), operate machines frequently used in that area (14 firms), know and use basic processes and equipment common to this area (11 firms), initiative (9 firms), overall good attitude (9 firms), neatness (7 firms), mechanical aptitude (7 firms), know products and processes in print shop (7 firms), and basic general understanding (6 firms).

In the management related areas of estimating, sales and production supervision, a knowledge of the products and processes in the print shop was consistently the most frequently mentioned competency. In the estimating group the following ranking of competencies was found: knowledge of products and processes in the print shop (24 firms), calculate by hand and/or with calculator (14 firms), practical work experience (11 firms), precision (8 firms), ability to communicate (6 firms), initiative (6 firms), and characteristics of ink and paper (6 firms). Only four competencies were required for production supervision--knowledge of products and processes in the print shop (32 firms), practical work experience (23 firms), coordinate people and materials (22 firms), and initiative (10 firms). For the sales area, the four competencies receiving the necessary five percent of the responses were: know products and processes in the print shop (19 firms), initiative (17 firms), good overall attitude (13 firms), and know and apply principles of selling (7 firms).

The fast copy center required the following competencies: operate machines frequently used in that area (10 firms), manual dexterity

(8 firms), know and use processes and equipment common to this area (6 firms), precision (5 firms), initiative (4 firms), good overall attitude (4 firms), neatness (3 firms), and ability to communicate (3 firms).

The other category identified four competencies which are necessary: ability to communicate (5 firms), good overall attitude (3 firms), initiative (3 firms), and know products and processes in the print shop (2 firms).

In-Service Training

Present programs for in-service upgrading or retraining of skilled graphic arts workers involve several agencies. The most used training program involves the training personnel within the company itself. Slightly over one-third of all responding companies (34.62 percent) use this method of up-grading or retraining. Trade associations (15.93 percent), trade plants (12.91 percent), and public or private school classes (11.81 percent) are also used by more than ten percent of the firms. Slightly more than one of each six firms say they conduct no training program. These data are shown in Table 92.

A total of 56 firms indicated that they wished to have contact from the nearest vocational graphic arts program. The names of these firms were forwarded to the Industrial Education Section of the Missouri Department of Elementary and Secondary Education for distribution to the vocational schools.

Table 92

DISTRIBUTION OF FIRMS CONDUCTING IN-SERVICE AND/OR RETRAINING PROGRAMS FOR SKILLED GRAPHIC ARTS OCCUPATIONS

Type of Training	No. of Firms	Percentage of Response
Trade Plants	47	12.91
Trade Associations	58	15.93
Company Training Personnel	126	34.62
Public or Private School Classes	43	11.81
Outside Agencies or Consultants	17	4.67
Suppliers	8	2.20
Not Conducted	65	17.86
Totals	364	100.00

Chapter 5

SUMMARY, CONCLUSIONS, IMPLICATIONS, AND PROBLEMS FOR FURTHER STUDY

The purpose of this study was to ascertain the current status and trends of the graphic arts industries and graphic arts education in Missouri as a basis for later development of a formal body of content related to graphic arts for the various levels of occupationally oriented industrial arts and vocational industrial-technical education in the secondary schools of Missouri.

More specifically, the study was designed to answer the following questions:

1. What are the graphic arts course offerings in the public secondary schools of Missouri?
2. How many students are enrolled at the various grade levels in graphic arts courses?
3. What course content is being included in the graphic arts courses?
4. What educational and work experiences do graphic arts teachers have?
5. What responsibilities do and should graphic arts teachers have for production activities in their laboratories?
6. What are the nature, size, and trends of the graphic arts industries in Missouri?
7. What are the sources, desired educational attainment levels, and problem areas of employees in the graphic arts industries?

8. To what extent are various operations performed in the graphic arts industries?
9. What type of equipment is being used in the graphic arts industries?
10. What knowledges, skills, personal characteristics, and experiences are desired of vocational-technical school graphic arts graduates by employers?
11. What changes in the present secondary school graphic arts course offerings could be recommended to better reflect the existing status of the graphic arts industries of Missouri?

The research study consisted of a rather extensive review of research and statistical data related to the graphic arts in addition to the two status surveys included in the Missouri Industrial and Educational Graphic Arts (MIEGA) Survey. One survey examined the graphic arts industries of Missouri in 1975 while the other studied the graphic arts offerings in the public secondary schools of Missouri during the 1974-75 school year.

A short initial survey form was mailed to 683 public secondary schools in Missouri to identify those offering instruction in graphic arts. Of the 387 responding firms eighty-two offered some graphic arts instruction in the industrial education program. An additional seven non-responding schools were known to offer graphic arts; hence, comprehensive long forms were mailed to eighty-nine schools. Sixty-four of these returned the long forms; however, only forty-two of the responding schools actually offered graphic arts. These forty-two schools provided the data for the major portion of the graphic arts education survey.

The industrial survey instrument was mailed to 1389 commercial printing establishments and 631 in-plant printing operations, a total of

2020 plants in Missouri. A total of 231 commercial firms and 131 in-plant firms responded to the information form and 141 commercial firms and 91 in-plant firms provided usable data and were included in the data analysis.

The responses to both the educational and industrial surveys were coded for computer analysis and described in narrative and tabular form. Many of the data from the industrial firms were further analyzed by the commercial and in-plant subgroups. Likewise further analysis of the educational data was made for the junior high, comprehensive junior-senior high, and vocational-technical high school subgroups.

Research studies, state curriculum guides, and textbooks were also studied to identify potential models and/or content outlines for future graphic arts curriculum development in Missouri.

Summary

Graphic Arts Education

The survey of graphic arts education in Missouri involved two information forms. The first firm was an initial short form mailed to all 683 public secondary schools identified in the 1973-74 edition of the Missouri State Department of Elementary and Secondary Education publication, Industrial Arts Education Personnel Directory. Usable returns were received from 387 respondents comprising 56.67 percent of the schools.

Eighty-two responding schools (21.2 percent) included graphic arts instruction in their industrial education offerings, while another fifteen percent offered some graphic arts instruction in another department of their school. Nearly ten percent of the schools indicated that they planned to add graphic arts offerings in industrial education within two years of the study.

A follow-up telephone survey of ten percent of the non-respondents indicated that the respondents were representative of all Missouri secondary schools.

Longer and more comprehensive information forms covering three areas--the graphic arts instructor, general information on graphic arts offerings, and graphic arts course content--were developed and mailed to eighty-nine schools that indicated graphic arts offerings on the short form or that were known to include graphic arts instruction.

Sixty-four of the eighty-nine schools responded, with forty-two offering graphic arts in the industrial education instruction. Of these, twelve were separate junior high schools and nine were vocational-technical schools. The remaining twenty-one schools were comprehensive junior-senior high schools. Thus, about eleven percent of the schools responding to the initial form actually offered graphic arts instruction.

The forty-one schools responding to the form about the graphic arts instructors employed a total of 56 instructors, a mean of 1.36 instructors per school. Only three responding schools employed more than two graphic arts teachers.

Nearly two-thirds of the responding teachers were between 26 and 35 years old. The mean age of all graphic arts instructors was 34.77 years. Vocational teachers tended to be older than the teachers from other schools.

Seven of the nine vocational school teachers had no college degree and two vocational teachers in the comprehensive school lacked college degrees. All other teachers had at least a bachelors degree, except another vocational school teacher with an associate degree. Nearly forty-five percent of the degreed instructors had at least a masters degree.

Nearly three-fourths of the baccalaureate degrees and two-thirds of the masters degrees were education degrees. Eighty-two percent of the degrees awarded to the graphic arts teachers were from colleges and universities within Missouri.

The graphic arts teachers in Missouri had earned a mean of 5.4 semester hours of college credit in graphic arts. More than one-third of the graphic arts instructors had no college credit in graphic arts and more than three-fourths had earned six semester hours or less. Nine of the twenty teachers reporting no college credit were vocational teachers with at least twelve years of graphic arts work experience. Another vocational teacher and two junior high school instructors without college credit had at least eight months of industrial graphic arts experience. Eight graphic arts teachers had neither work experience nor college credit in the graphic arts. Although graphic arts instructors averaged more than five years of work experience in graphic arts, only twenty of the responding fifty-four teachers had any such experience.

Missouri's graphic arts teachers experience the following mean number of years of teaching tenure: 5.08 years in the current school, 4.49 years in graphic arts instruction, and 7.40 years of total teaching. Among the three types of schools comparative means varied little for the years in the current school and the total years; however vocational teachers averaged more than two years greater experience in teaching graphic arts than those in other types of schools.

Teachers listed a variety of other experiences which they considered valuable to their teaching. Industrial work experience, self study, industrial seminars and institutes, union courses, trade shows and exhibits, contacts with suppliers, and part-time work as a student were those mentioned by most of them. These same types of activities, along with more college graphic arts courses, were also specified as being future experiences desired by graphic arts instructors. Courses in photography, offset printing, screen printing, darkroom techniques, and layout and design were specific topics for which college courses were desired.

Twenty-six of the forty-two responding schools with graphic arts offered only one course, eleven offered two courses, four offered three courses, and one school offered four courses. Most junior high schools offered one course, most comprehensive junior-senior high schools offered one or two courses, and most vocational-technical schools offered a two-year course.

Nearly all junior high schools scheduled from three to seven sections of their graphic arts courses. Most comprehensive schools offered one section of their courses and most vocational schools scheduled the typical two-year course in graphic arts--two sections, each for a half day. The overall mean number of sections per graphic arts course in Missouri was 3.67 sections.

In the junior high schools the mean number of clock hours of instruction in graphic arts was 26.14 hours and no school reported more than 90 hours for a course. The mean for the comprehensive schools was 157.03 hours. Two-thirds of these courses met from 51 to 180 class hours. The mean number of class hours for vocational schools was

467.83 hours; the range was from 180 to 600 clock hours.

The mean number of students served by the sixty courses was approximately 60 students, with each section having a mean enrollment of about 25 students. The mean number of students ranged from almost 32 per section in the junior high schools to just over 13 per section in the vocational schools.

The junior high schools most often included students in grade 8 while the comprehensive and vocational schools most frequently included students in grade 11 and 12.

The course titles most frequently used for courses which included graphic arts instruction were General Shop, Graphic Arts, Photography, and Printing. Graphic arts courses with many other titles were found in Missouri.

Nearly one-third of all schools offering graphic arts began that instruction between 1973 and 1975. Another forty percent of the schools revised the content of their graphic arts courses during that period.

Only four schools predicted a need for an additional graphic arts instructor from 1975 to 1977.

All vocational-technical instructors indicated some duties related to production printing; however, over half of the junior high and one-third of the comprehensive school instructors indicated that their responsibilities involved instruction only. Most of the comprehensive school instructors and junior high instructors with production printing responsibilities spent less than one-fourth of their time for these obligations. Most vocational instructors spent from one-fourth to three-fourths of their time on production activities. A large majority of the teachers considered the production printing activities as a significant aid to their graphic arts instruction.

Most schools with production graphic arts activities printed poster, programs and tickets; administrative forms; work for other instructors; and pamphlets, brochures, and booklets. Several schools included production photography for the school yearbook and newspaper among their graphic arts activities. Most schools with production graphic arts activities perform the entire sequence of printing processes from design through finishing, using both the offset lithography and letterpress transfer methods.

The amount of graphic arts equipment found in the secondary school laboratories varied greatly. Of the twelve junior high schools responding, at least three schools had the following equipment: type banks with foundry type, hand-operated platen presses, manual paper cutters, imposition stones, hot stamping presses, and proof presses. At least half of the twenty-one responding comprehensive junior-senior high schools reported having an offset press or duplicator, a platemaker, some light tables, and a manual paper cutter. At least eight of the nine vocational schools had an offset press or duplicator, a platemaker, light tables, a power paper cutter, imposition stones, a horizontal process camera, a larger offset press, folders, stitchers, and paper drills.

All schools agreed that the district paid for their capital equipment; however, only half of these schools also paid for all printing supplies. Students paid for some or all supplies in most of the remaining districts.

Most schools failed to respond to a request for the amount of annual expenditure for graphic arts equipment and supplies. Although some respondents did report supply budgets up to $10,000 annually and equipment budgets up to $20,000 annually, most were considerably smaller. Since no comprehensive school reported an annual budget for equipment of more than $1000, this type of school appeared to have the weakest financial support.

The principal strengths listed by teachers for their graphic arts programs were that the program gives broad, exploratory experience with career information; the students gain work experience; and the department has up-to-date equipment. Principal weaknesses noted by other teachers were lack of up-to-date equipment, inadequate laboratory time, lack of space, and lack of funds.

The course objectives most often accepted and ranked highest for courses in junior high and comprehensive high schools were "develop student interest in graphic arts" and "acquaint students with graphic arts careers". Vocational school respondents ranked "provide job entry skill in a cluster of graphic arts occupations" highest among course objectives.

Among reproduction processes used in the secondary schools, the junior high schools emphasized the relief and stencil processes. The four reproduction processes were combined more among comprehensive school courses; however, eight used no planographic transfer, eight used no stencil processes, four used no relief printing, and twenty-one did no intaglio work. Among the vocational schools all used planography at least three-fourths of the time and relief printing the remaining time.

More than 300 specific graphic arts instructional topics were identified and respondents indicated the intensity of their instruction on each topic. A mean value was compiled for each topic based upon the numerical responses. Then a coverage value was assigned to each topic based upon the mean value and using the following scale: 0 for mean values below 0.67, 1 for mean values between 0.67 and 1.49, 2 for mean values between 1.50 and 2.49, 3 for mean values between 2.50 and 3.33, and 4 for mean values above 3.34.

In the junior high schools no topics received coverage codes above 2 and code 2 coverage was indicated for topics generally related to stencil printing, design, and safety. All phases of photography, as well as planographic and intaglio printing, received 0 coverage in the junior high schools.

Topics related to the scope and history of graphic arts, career and job orientation, safety, design and layout, and planographic printing fundamentals were given code 2 coverage in the comprehensive schools. Most other topics received code 1 coverage, except for rather specialized topics which were rated as 0.

Most topics received code 2, 3, or 4 coverage in the vocational-technical high schools, except those related to continuous tone photography and letterpress printing which received 1 or 2 code coverage and those on intaglio and stencil printing which were omitted from vocational courses.

Graphic Arts Industry

The survey of graphic arts industries in Missouri involved a comprehensive information form mailed to 2020 printing firms in Missouri. Commercial printing firms comprised 1389 of these establishments while the remaining 631 were in-plant operations. The commercial firms were those listed in the Missouri Directory of Manufacturing and Mining, 1973 in the SIC 2700 Printing and Publishing series as well as a few listed in other related classifications. The in-plant firms were identified by the In-Plant Printing Management Association and Printing Industries of America chapter in Missouri, by distributors of graphic arts equipment and supplies, by a Dun and Bradstreet survey mailing list, and by personal knowledge of the project staff. Many of the listed firms were later found to be out-of-business or to have moved out-of-state. Other forms were returned with no corrected address.

Of the 231 commercial and 131 in-plant printing establishments in Missouri who returned the forms, 141 commercial and 91 in-plant firms provided usable data. These figures of usable data represent approximately eleven percent of the original mailing list of just over two thousand firms. In order to determine the randomness of the respondents the chi square analysis was employed. The responding commercial firms were found to be no different than the entire commercial subgroup with regard to Standard Industrial Classification category, number of employees, and location of firms.

More than one-fourth of the 232 responding firms were involved in each of three classifications of printing--general commercial printing, general office duplicating, and business forms printing. Within the various classifications most companies were not highly specialized. Only in the newspaper and commercial, trade plant, and general commercial classifications did a majority of firms concentrate more than half of their work load in one classification.

The most significant trends related to printing classifications were that general commercial printing was expected to increase considerably by the commercial subgroup while the in-plant subgroup expected increases in the business forms, general office duplicating, and fast copy center classifications.

When the image transfer methods used by Missouri graphic arts industries were reported, more than seventy percent used lithography, more than thirty percent used letterpress, and nearly fifteen percent used xerography. Only for lithography do firms concentrate on one method of image transfer--about half of the firms do ninety percent of their work by lithography. Among trends reported, an overall increase in the use of lithography was most significant.

Two-thirds of Missouri's graphic arts firms employ less than ten employees. Among the few firms responding to items dealing with changes in employment numbers, the data shows that the average change in the number of employees per firm is an increase of nearly three percent over a period of about eighteen months. The production areas with the most employees were the diversified and offset press work categories. Most production areas employed a mean of from three to five employees.

The most popular source of employees was from other shops or companies. Off the street, advancement within the company, and general high school also were mentioned frequently. Most production areas consistently rated other shops and companies as the most popular source of employees. Among in-plant firms, advancement within the company was more often mentioned than other sources.

More than two-thirds of the firms indicated that a general high school or vocational high school education is desired for graphic arts positions. General high school was deemed adequate for each production area except continuous tone photography, process camera work, stripping, platemaking (offset, relief, and gravure), and press work (offset and relief) where a vocational-technical high school background was desired most frequently and in sales, estimating, and production supervision where a college or university education was desired. In general, the commercial firms often desired general high school background, while the in-plant firms usually desired vocational school preparation.

Six problem areas were selected with nearly the same frequency by graphic arts firms as being major problems among employees in a specific production area of their firm. These problem areas were: lack of basic technical knowledge; communications breakdown; careless, inaccurate work; inability to recognize and evaluate inferior work; lack of speed; and lack of understanding of the entire production process.

In the section dealing with the plant operations performed, it was found that many of the layout and design, copy preparation, continuous tone photography, film processing, and enlargement/reduction activities were performed by the plant staff. In addition, most firms also used outside agencies to a lesser degree for these activities.

At least twenty percent of the responding firms used the following composition methods: handset type, line-casting machines, strike-on composition, phototypesetting, pre-printed copy, and repro proofs. A similar percentage used the imposition methods of page imposition at paste-up, film stripping, and step and repeat imposition.

Reproduction photography operations receiving frequent usage were line photography, contacting, halftone photography, paper positives, multiple color special effects, and tray processing. The firms used both positive and negative stripping and both line and color proofing activities.

More than twenty percent of the respondents used the direct image masters, photo-direct plates, and both positive and negative working presensitized plates for their planographic plates.

The finishing and binding operations used by at least twenty percent of the respondents were: hand and machine folding, manual trimming, punching, scoring, numbering, perforating, drilling, hand and machine collating, padding, hand wrapping, mechanical binding, wire stitching and stapling, mailing, stuffing, addressing, slitting, die cutting and laminating.

The most used type of press was the sheet-fed 14" x 20" standard offset press or duplicator. A number of other firms used automatic small offset presses, large sheet-fed offset presses, sheet-fed platen presses, sheet-fed cylinder presses, and hand-fed screen presses. Most firms used only paper as a substrate for the image.

Although the competencies listed by the respondents as desirable for a graduate of a vocational-technical graphic arts program varied considerably by the production area, the following physical, personal, skill, or knowledge competencies were mentioned by at least two percent of all respondents: mechanical aptitude, manual dexterity, neatness, initiative, ability to communicate, precision, overall good attitude, art and design principles, photographic principles, products and processes of printing, processes and equipment common to the specific area of employment, basic general understanding, structure of English language, practical work experience, and operation of machines frequently used in the area of employment.

The most used training program for upgrading or retraining skilled graphic arts workers involved the training personnel within the company.

Conclusions

To the extent that the data and findings resulting from the research procedure employed in this study are valid and representative of all graphic arts programs of the public secondary schools of Missouri or of all graphic arts industries of Missouri the following conclusions are drawn:

Graphic Arts Education

Although the study indicates that the graphic arts offerings in Missouri's secondary schools continue to expand in the number of schools offering graphic arts, the number of courses being offered, and the breadth of content within courses, a vast majority of students in the secondary schools of Missouri receive no graphic arts instruction.

When the numbers of enrollments, clock hours of instruction, and grade levels are examined it may be observed that graphic arts instruction in Missouri's secondary schools reaches a considerable number of students around grade eight for a short period of instruction and then reaches a smaller number of students for some in-depth instruction around grades eleven or twelve.

The graphic arts offerings in Missouri generally lack a total coordinated approach. Articulation of objectives, courses offered, and course content at the various instructional levels within school districts often seems to be lacking. Few schools offered sequential graphic arts courses from grades seven through twelve.

In many schools the instructional content--processes, information, and equipment--related to graphic arts does not reflect the contemporary graphic arts industry. The processes and equipment found in most junior high school programs are narrow in scope, often out-of-date with industrial practices, and seldom related to the cluster approach often advocated for this level. The comprehensive school offerings are inconsistent. Although some comprehensive schools offer junior high level instruction in graphic arts, few schools have broad, general graphic arts courses appropriate as an exploratory course to aid in career guidance prior to enrolling in vocational courses. The vocational courses are generally up-to-date; however, the total emphasis on offset lithography and letterpress may be narrow in scope to meet the diversified needs of the broad range of graphic arts industries.

The primary course objectives in the Missouri junior high and comprehensive junior/senior high schools are to develop student interest in the graphic arts and to acquaint students with graphic arts careers. The principal objective of most vocational school programs is to provide job entry skill in a cluster of graphic arts occupations.

The typical Missouri graphic arts teacher is likely to be a male who is from twenty-six to thirty-five years old. He typically would have earned at least a bachelors degree from a Missouri college or university if he was teaching in a junior high or comprehensive high school, but would have no degree if he was teaching in a vocational school. He probably has completed less than six semester hours of graphic arts courses. He will have less than ten years of total teaching experience with less than six of these in his present position and less than four years in teaching graphic arts. A vocational teacher is likely to have had at least ten years of industrial work experience in graphic arts while other graphic arts teachers probably had little industrial experience.

Most graphic arts teachers in Missouri lack depth in pre-service and in-service preparation in graphic arts and they express a need for more college courses, industrial work experience, and special industrial workshops or seminars related to graphic arts.

Most instructors of graphic arts beyond the junior high school general industrial arts course have responsibility for some production graphic arts activities and continue to advocate the inclusion of selected production activities as a part of graphic arts instruction. They were careful to add that production deadlines must not determine the instructional experiences of a course.

The financial support of secondary school graphic arts instruction seems to be distributed more in proportion to the depth of instruction rather than the breadth of instruction. Generally, large amounts of money are spent for vocational programs where a very few students receive many hours of instruction, while few monies are expended for exploratory programs which reach many students for a few hours of instruction.

All school districts paid for the graphic arts equipment; however, in the junior high and comprehensive schools, students usually paid for some or all of the graphic arts instructional supplies.

From the responses of Missouri graphic arts teachers it appears that a strong graphic arts program would have positive administrative support with up-to-date equipment, adequate space, and adequate funding. The course offerings would include a broad introductory offering followed by a sequence of advanced courses through the vocational level, all with laboratory experiences. An experienced teacher would work with students of varying abilities who could profit from such instruction and who have interest and aptitude in graphic arts.

Graphic Arts Industry

Missouri's industries have much graphic arts activity beyond those included among commercial printing and publishing firms in the Standard Industrial Classification 2700 series. In-plant graphic arts facilities are difficult to identify as equipment distributors and suppliers are reluctant to release names of their clients and related professional groups do not have comprehensive lists of potential members; hence, the real extent of the total graphic arts activity is difficult to estimate. The mobility of graphic arts firms appears to be considerable as many address changes, business closings, and new business openings were observed as a part of this investigation.

Most graphic arts industries in Missouri are rather general in the types of activities they accomplish. Except for some rather specialized printing shops in the classifications of "newspaper and commercial," "trade plant," and "general commercial," commercial printers usually include several classifications of graphic arts activities in their work load. The in-plant printers are also diversified in their activities, except for some facilities doing almost exclusively "general office duplicating".

Expected trends in commercial printing include an increase in general commercial printing. The in-plant firms expect greatest increases in business forms, general office duplicating, and fast copy centers.

Although most printing firms used more than one image transfer method, both the commercial printers and in-plant printers overwhelmingly use lithography as the principal method of image transfer. The commercial printers also make some use of letterpress and screen printing and the in-plant firms make some use of xerography. The principal trends are for greatly increased use of lithography in both types of establishments and some increase in xerography among in-plant firms.

Graphic arts firms in Missouri, like those across the nation, are small in terms of the number of employees hired. Two-thirds of Missouri's graphic arts firms employ less than ten workers.

Vocational-technical graphic arts programs apparently are not serving their purpose very well in the eyes of industry, since these schools were not a strong source of graphic arts employees and were not the educational level most desired for most new employees. The in-plant firms are more likely than the commercial firms to desire the vocational-technical graduate as an employee.

Vocational-technical school graduates were preferred over other educational levels for the production areas of continuous tone photography, process camera work, stripping, platemaking, and presswork. College graduates were desired for sales, estimating, and production supervision.

A majority of companies have a printing staff which performs most all printing operations from idea to the finished product within the plant. Outside specialist firms are used to a lesser extent.

As would be expected with the widespread use of the planographic image transfer method in Missouri, the operations related to the composition, imposition, photography, stripping, proofing, image carrier preparation, and press operations for this transfer method were frequently used. However, operations related to the relief transfer method are also utilized to a lesser extent. A vast array of finishing and binding operations are also performed by graphic arts firms.

Paper is the principal substrate used in Missouri and the 14" x 20" sheet-fed standard offset press or duplicator was the most popular press.

The competencies desired of a vocational-technical graphic arts graduate varied with the production area in which the worker was to be employed. These desired competencies often involved personal characteristics as well as skills and knowledge.

Implications

1. Since present state certification requirements for industrial arts teachers in Missouri omit specific reference to graphic arts courses, these requirements are unrealistic for preparing teachers to teach graphic arts and should be updated to include some graphic arts.
2. Since few Missouri colleges and universities offer in-depth graphic arts instruction, they should examine their offerings and consider expanding to meet the needs of individuals wishing to specialize in teaching graphic arts. Since many teachers teach as they have been taught, colleges and universities should also offer cluster courses which combine graphic arts instruction within more generalized courses for industrial arts teachers. In-service graphic arts courses, seminars, and industrial work experience should be offered or coordinated by colleges and universities to allow for continual improvement of graphic arts instructors.
3. The expenditure per student enrolled was found to be quite high in vocational-technical schools and the preference of industry for this type of graduate was not always found to exist; therefore, perhaps

alternative systems for preparing graphic arts workers should be examined. Certainly dialogue between graphic arts education and the graphics arts industry must improve in order to maximize the matching of job opportunities and educated workers. It seems that well-selected advisory committees should aid in this effort.

4. Since many current graphic arts offerings in the schools were not representative of contemporary industry, schools should study industrial practices and attempt to up-date their courses and equipment accordingly.
5. Since most Missouri industries are rather general in the types of graphic arts activities and types of image transfer methods used and since many employees must be able to perform a variety of tasks, the secondary school should offer a broad range of graphic arts activities. These activities should predominantly emphasize the lithographic method of image transfer since it is used far more than other methods.
6. Since few schools offered cluster courses which include graphic arts instruction at the junior high school level, schools should be encouraged to study successful cluster programs and to consider modifying their curriculums to include this concept.
7. Since a general high school education was the educational level desired by employers for new graphic arts employees in many areas, more non-vocational graphic arts courses may be desirable at the senior high level to allow students to explore graphic arts activities without a specific vocational committment.
8. In-plant firms tend to want vocational graphic arts graduates more than the commercial firms; hence, graduates of these programs should

especially investigate the in-plant job opportunities.

9. Assuming that the percentages of the responding schools and of the telephone sampling of non-respondents are representative of all 683 secondary schools in Missouri identified in the study, only ninety-eight schools would be expected to offer graphic arts instruction in the state. Of these, twenty-eight would be separate junior high schools, forty-nine would be comprehensive junior/senior high schools, and twenty-one would be vocational-technical schools. A total of 5091 Missouri students would be enrolled in some phase of graphic arts instruction in the industrial education departments of these schools. The junior high schools would enroll 2804 students in 134 sections of graphic arts, the comprehensive schools would enroll 1582 students in 735 sections, and the vocational schools would enroll 705 students in 52.5 sections.

10. Since the examination of a number of state and city curriculum guides failed to identify a better model for instructional levels than that presented in the Missouri Handbook for Industrial Arts Education, the committee writing the graphic arts curriculum guide is encouraged to use the four levels described in the Handbook. In order to incorporate vocational graphic arts into the curriculum pattern, the concept incorporated into Level IV instruction may be interpreted to include vocational instruction. Likewise the cluster concept may be included in Level I instruction. The content models described in the Related Research section of this study also should be given special consideration by the committee.

Problems for Further Study

In connection with the conduct of this study, a number of related problems of sufficient importance to be worthy of investigation presented themselves. They are as follows:

1. What is the scope and depth of graphic arts activities offered in the public secondary schools of Missouri in departments other than industrial education? How are they coordinated with those offered in industrial education?
2. How successful are the graduates of the vocational graphic arts courses in Missouri in obtaining placement? Are students enrolled in cooperative education programs more or less successful than vocational school graduates?
3. What exploratory graphic arts courses are offered in the secondary feeder schools of the vocational-technical graphic arts programs of Missouri? Have enrollees in vocational school graphic arts programs had previous credit in exploratory graphic arts?
4. What apprenticeship programs in graphic arts are presently available in Missouri's industries? How many persons are presently registered? How does this match the number of workers needed? Where are these apprenticeships located and how does this compare with the labor supply and demand in these areas? Are they mobile to meet other area needs?
5. Why are industries not choosing graphic arts graduates of vocational schools over general high school graduates for all graphic arts positions? Have industries with negative attitudes toward vocational graduates provided input into the vocational school curriculum?

6. What are the present and future job opportunities in the labor market surrounding the area vocational schools offering graphic arts? How do these relate to the location of apprenticeship training programs and post-high school graphic arts programs? Are training programs located near the area of high worker demand?
7. What percent of the graphic arts enrollees are women? Are the reasons for enrolling in graphic arts the same for men and women?
8. What area colleges and universities offer enough graphic arts courses to prepare a specialized graphic arts teacher? What additional offerings are needed?
9. What industries offer seminars or workshops in graphic arts suitable for graphic arts teachers? What industries offer positions for graphic arts teachers to obtain industrial work experience?
10. What is the job market for graphic arts workers as listed by Employment Security?
11. What are the characteristics of graphic arts firms that have opened for business during the past few years? How do they compare with the established firms?
12. What should be the learning units to be included in curriculum guides in graphic arts for the public schools of Missouri?

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APPENDIX A

Standard Metric Paper Sizes

International Organization for Standardization

Standard Metric Paper Sizes*

A Series--for general printing, including cut stationery and periodicals

2A	1 189mm X 1 682mm	
A0	841mm X 1 189mm	=1 square meter
A1	594mm X 841mm	
A2	420mm X 594mm	
A3	297mm X 420mm	
A4	210mm X 297mm	
A5	148mm X 210mm	
A6	105mm X 148mm	
A7	24mm X 105mm	

B Series--for posters and wall charts

4B	2 000mm X 2 828mm	
2B	1 414mm X 2 000mm	
B0	1 000mm X 1 414mm	
B1	707mm X 1 000mm	
B2	500mm X 707mm	
B3	353mm X 500mm	
B4	250mm X 353mm	(also envelope size)
B5	176mm X 250mm	(also envelope size)
B6	125mm X 176mm	

C Series--for envelopes, postcards, folders

C3	324mm X 458mm	for A3 sheet
C4	229mm X 324mm	for A4 sheet
C5	162mm X 229mm	for A5 sheet or A4 folded
C6	114mm X 162mm	for A6 sheet, A5 folded, or A4 folded twice
C7	81mm X 114mm	for A7

Other international envelopes sizes

B6/C4	125mm X 324mm
DL (DIN Lang)	110mm X 220mm
C7/6	81mm X 162mm

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*Cameron, Clive A., Going Metric with the US Printing Industry (Rochester, N.Y.: Graphic Arts Research Center, Rochester Institute of Technology, 1972), pp. 102-107.

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APPENDIX B

Graphic Communication Curriculum Model--Fecik

Graphic Communication Curriculum Model--Gysler

STRUCTURE FOR GRAPHIC COMMUNICATION TECHNOLOGY

Revised and Validated Copy

DESIGN

- DESIGN PRINCIPLES
  - BALANCE
  - PROPORTION
  - HARMONY
  - RHYTHM
  - CONTRAST
  - UNITY
- TYPOGRAPHY
  - TYPE FACE NOMENCLATURE
  - TYPE FACE CLASSIFICATION
- COPYFITTING
- ESTIMATING
- SPECIFICATIONS
- PAPERSTOCK
- LAYOUT TECHNIQUES
  - TYPES OF LAYOUT
  - DUMMIES
  - PASTE-UPS
- COLOR THEORY
  - COLOR TERMINOLOGY
  - COLOR SYSTEMS
  - PROCESS COLORS
- PHOTOGRAPHY
  - SIVER HALIDE EMULSIONS (Continuous Tone Material)
    - BLACK & WHITE
    - COLOR

COPY GENERATION

- ASSEMBLY OF CHARACTERS
  - MANUAL MODES
    - HAND SET TYPE
    - PASTE-UP
    - STRIKE-ON
    - PAPER TYPE
    - PHOTOGRAPHIC APPLICATIONS
  - MECHANICAL MODES
    - LINECASTERS
    - PUNCHED MEDIA
  - ELECTRO-MECHANICAL MODES
    - PUNCHED MEDIA
    - MAGNETIC MEDIA
  - ELECTRONIC MODES
    - ON-LINE COMPUTER
    - OFF-LINE COMPUTER
- STORAGE AND RETRIEVAL MODES
  - MANUAL MODES
    - TYPE CASES
    - PAPER
    - CLIP ART
  - PUNCHED MODES
    - CARDS
    - TAPES
    - TAGS & COUPONS
  - FONT MODES
    - ACETATE
    - GLASS
    - METAL
  - MAGNETIC MODES
    - TAPES
    - DISKS
    - INKS
    - OPTICAL SCANNERS
  - FILM MODES
    - FRAMES
    - STRIPS
    - MICROFORMS
  - ELECTRONIC SIGNALS
    - CHARACTER GENERATION
    - OPTICAL SCANNERS
    - CATHODE RAY TUBES
    - MEMORY DEVICES

IMAGE CONVERSION

- ASSEMBLY OF COPY COMPONETS
  - MAKE-UP*
  - PROOFING
  - ADAPT & SUPPLEMENT OPERATIONS
- MANUAL CONVERSION
  - HAND SET TYPE
  - SCREEN PROCESS
- MECHANICAL CONVERSION
  - LINECASTERS
  - PANTOGRAPH
  - DUPLICATION or MOLDING
- PHOTOMECHANICAL CONVERSION
  - PROCESS PHOTOGRAPHY
    - LIGHT-SENSITIVE EMULSIONS (High Contrast Material)
      - COLLOIDS
      - PHOTOPOLYMERS
      - DIAZO
      - STABILIZATION
    - COLOR SEPARATION
      - COLOR CORRECTION
      - COLOR PROOFING
      - DENSITOMETRY
    - PROCESSOR UNITS
      - FILM
      - PLATES or IMAGE CARRIERS
- ELECTROCHEMICAL CONVERSION
- ELECTROSTATIC CONVERSION
- ELECTRONIC CONVERSION

*Stripping, Imposition, Layout are interchangeable terms. The terms vary according to the reproduction process. The process must be identified with the term used.

IMAGE CARRIERS

- ADDITIVE UNITS
  - HAND SET TYPE
  - LINECAST SLUGS
- SOLID PLATES
  - PHOTOENGRAVING
  - WRAP-AROUND PLATES
  - PHOTOPOLYMER PLATES
  - ENGRAVED or ETCHED PLATES
  - GRAVURE CYLINDERS
  - STONE LITHOGRAPHY
  - OFFSET LITHOGRAPHY
  - COLLOTYPE
  - LAMINATED PLATES
  - GLASS
- POROUS CARRIERS
  - FABRIC
  - METAL
- DUPLICATE CARRIERS
  - ELECTROTYPES
  - STEREOTYPES
  - PLASTIC PLATES
  - RUBBER
  - SIDEROGRAPHY
- ENERGY CHARGED CARRIERS
  - SELENIUM SURFACES
  - ZINC OXIDE COATED PAPER
  - METAL PINS
  - VIDEOJET
  - GLASS

REPRODUCTION DEVICES

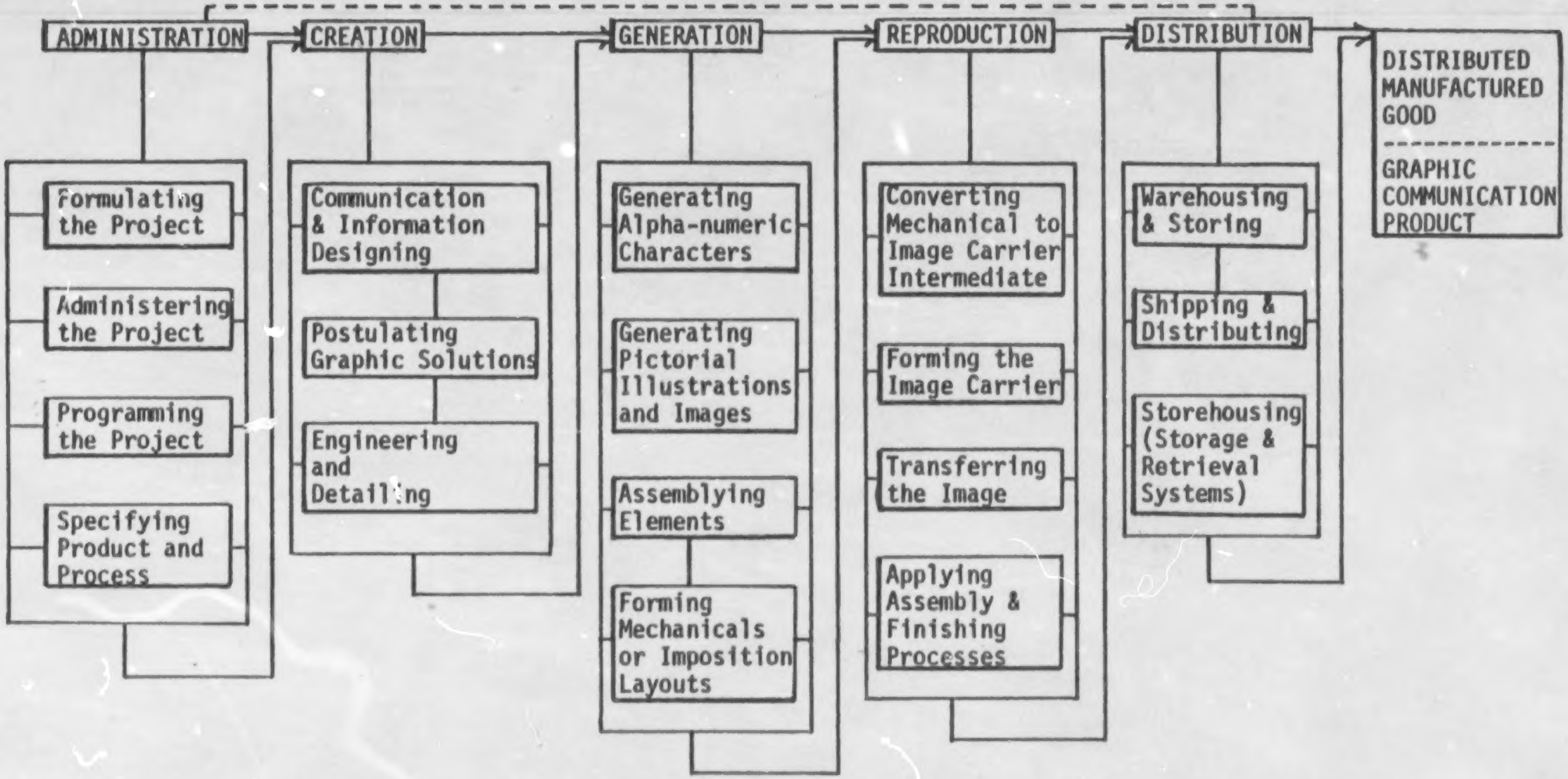
- IMPACT DEVICES
  - RELIEF PRESSES
    - LETTERPRESS
    - FLEXOGRAPHY
    - INDIRECT
  - LITHOGRAPHY
    - OFFSET
    - COLLOTYPE
  - SCREEN PROCESS
    - MANUAL DEVICES
    - MECHANICAL DEVICES
      - FLAT BED
      - CYLINDER
- NON-IMPACT DEVICES
  - ELECTROSTATIC
    - XEROGRAPHY
    - ELECTROFAX
    - VIDEOJET
  - LIGHT ENERGY DEVICES
    - LASER ACTIVATED

FINISHING OPERATIONS

- BINDING OPERATIONS
  - MECHANICAL BINDING
    - EXCHANGABLE PAGES
    - NON-EXCHANGABLE PAGES
  - CASE (Edition) BINDING
  - ADHESIVE (Perfect) BINDING
- AUXILIARY OPERATIONS
  - CUTTING
  - PAPERSTOCK
  - FOLDING
  - ADDRESSING
  - EMBOSSING
  - DIE-CUTTING
  - LAMINATING
  - PACKAGING
  - PERFORATING
  - DRILLING
  - PUNCHING
  - DECORATING
  - VARNISHING

John Thomas Fecik, "The Identification and Classification of Graphic Communication Technology," (unpublished Doctor's dissertation, University of Maryland, 1970), p. 263.

THE CONCEPTS AND MAJOR PROCESSES OF GRAPHIC COMMUNICATION TECHNOLOGY


ADMINISTRATION
Formulating the Project
Administering the Project
Programming the Project
Specifying Product and Process
CREATION
Communication & Information Designing
Postulating Graphic Solutions
Engineering and Detailing
GENERATION
Generating Alpha-numeric Characters
Generating Pictorial Illustrations and Images
Assemblying Elements
Forming Mechanicals or Imposition Layouts
REPRODUCTION
Converting Mechanical to Image Carrier Intermediate
Forming the Image Carrier
Transferring the Image
Applying Assembly & Finishing Processes
DISTRIBUTION
Warehousing & Storing
Shipping & Distributing
Storehousing (Storage & Retrieval Systems)
DISTRIBUTED MANUFACTURED GOOD
GRAPHIC COMMUNICATION PRODUCT

Randolph Gysler, "A Rationale and Structure for Graphic Communication Technology With Implications For Industrial Arts Educating" (unpublished Doctor's dissertation, The Ohio State University, 1971), p. 413

APPENDIX C

Letter to State Supervisors

Letter to Selected District Supervisors

Letter to In-Plant Printing Management Association

Response from In-Plant Printing Management Association

Letter to Printing Industries of America

Response from Printing Industries of America

Letter to Suppliers

Letter to Evaluation Panel Members--Education Survey

Letter to Evaluation Panel Members--Industry Survey

CMSU CENTRAL MISSOURI STATE UNIVERSITY WARRENSBURG, MISSOURI 64093

SCHOOL OF APPLIED SCIENCES
AND TECHNOLOGY
PHONE 816-429-4031

November 18, 1974

Dear :

We are beginning a study to identify the desirable content for secondary level graphic arts programs in Missouri. Of course, we would like to incorporate the best possible ideas and procedures as we confer with representatives of the graphic arts industries and graphic arts education. Hence, we want to identify any curriculum guides published by states, school districts, or educational associations which relate to graphic arts.

Are any state or district curriculum guides on graphic arts (either industrial arts or vocational industrial/technical levels) available in your state? Do you know of graphic arts curriculum guides published by professional or trade associations? If so, what is the cost and from what source may they be obtained?

We will appreciate any assistance you are able to provide as we attempt to up-date available curricular materials.

Sincerely yours,

Charles E. Keseman, Professor
Industrial Arts & Technology

CMSU
CENTRAL MISSOURI STATE UNIVERSITY WARRENSBURG, MISSOURI 64093
SCHOOL OF APPLIED SCIENCES
AND TECHNOLOGY
PHONE 816-429-4031

March 19, 1975

Mr. Dwayne McMahan, Consultant for Industrial Arts
Boise Independent School District
Boise School Administration Building
1207 Fort Street
Boise, Idaho 83702

Dear Mr. McMahan:

We are beginning a study to identify the desirable content for secondary level graphic arts programs in Missouri. Of course, we would like to incorporate the best possible ideas and procedures as we confer with representatives of the graphic arts industries and graphic arts education. Hence, we want to identify any curriculum guides published by states, school districts, or educational associations which relate to graphic arts.

Your district has been recommended as having a fine program in graphic arts. Do you have any curriculum guides available which describe your program on graphic arts (either industrial arts or vocational/technical levels)?

We will appreciate any assistance you are able to provide as we attempt to up-date available curricular materials.

Sincerely yours,

Charles E. Keseman, Professor
Industrial Arts & Technology

EQUAL EDUCATION AND EMPLOYMENT OPPORTUNITY M/F

CENTRAL MISSOURI STATE UNIVERSITY WARRENSBURG, MISSOURI 64093

SCHOOL OF APPLIED SCIENCES
AND TECHNOLOGY
PHONE 816-429-4031

June 13, 1975

Don Slover, President
Kansas City Area Chapter
In-Plant Printing Management Association
Federal Reserve Bank of Kansas City
925 Grand Avenue
Kansas City, MO 64198

Dear Mr. Slover:

In cooperation with the Research Coordinating Unit of the Missouri State Department of Elementary and Secondary Education and Central Missouri State University, we are conducting the Missouri Industrial and Educational Graphic Arts Survey. This research project will attempt to identify the present graphic arts instruction being offered in the secondary schools of Missouri. In addition we will attempt to analyze the current practices in the graphic arts industries in Missouri and use these findings to establish recommended graphic arts curriculum for the secondary schools.

In order to identify the present practices in the graphic arts industries, we hope to obtain information from a sampling of the commercial establishments listed in the 1975 Missouri Directory of Manufacturing and Mining published by the Missouri Division of Commerce and Industrial Development. In addition we wish to identify firms throughout the state which have in-plant printing so that we can include them in our sample. It is in regard to this latter group that I am coming to you for assistance. Do you have a directory of industries with in-plant printing facilities for the state of Missouri? Or do you have a suggestion regarding a possible source of this information?

Mr. Mel Blazer, the Kansas City Area educational representative of the Multigraphics Division of Addressograph Multigraph Corporation, has indicated that he could provide a rather comprehensive list of in-plant printing facilities in the Kansas City, St. Louis, and Jefferson City areas. Do you feel that his list is likely to be biased or inadequate? I had initially felt that perhaps a paper or film distributor could give us a sampling which might be adequate. I would appreciate any thoughts which you or other members of your organization could give related to the listing of in-plant facilities in Missouri.

We hope to obtain the cooperation of as many people as possible in the state of Missouri involved in graphic arts education and the graphic arts industries. Since we believe that the study will be influential in establishing graphic arts curriculum at the junior high, senior high, and vocational-technical school levels in Missouri, it should be of significance to graphic arts industries that will hire personnel educated in these schools. We feel that in order to encourage maximum industrial participation, letters of endorsement of the desirability of this study by industrial organizations such as In-Plant Printing Management Association would be helpful. The letters of endorsement we request would in no way require financial involvement and would not necessarily imply support of the findings and recommendations of the study, but would simply be influential in encouraging members of these organizations to participate. Would your organization be willing to endorse the study with such a letter?

EQUAL EDUCATION AND EMPLOYMENT OPPORTUNITY M/F

In summary, we are requesting your response on two matters: (1) a directory of in-plant printing facilities in Missouri and (2) a letter endorsing the study we are undertaking. Thank you for any assistance you are able to provide.

Sincerely yours,

Charles E. Keseman
Project Director

CEK/sep

Also sent to:

Ms. Lorene Shockley
St. Louis Area Chapter IPMA

and

Mr. Will Hoskins
Mid-MO Chapter IPMA

IN-PLANT PRINTING MANAGEMENT ASSOCIATION

947 OLD YORK ROAD, ABINGTON, PA. 19001 – (215) 886-6575

W. H. Evans, Executive Vice President

Mr. Charles E. Keseman
Central Missouri State University
Warrensburg, Missouri 64093

Dear Mr. Keseman:

Your letter to Ms. Lorene Shockley regarding the Missouri Industrial and Educational Graphics Arts Survey has been forwarded for my action. Please forgive the delay in response.

Since in-plant graphics is an exploding market we are most interested in providing for those who will be entering into the labor force. It is essential that appropriate courses be made available.

IPMA is pleased to endorse the purpose of your survey. We would be glad to provide consultation and advice.

Our Kansas City and Columbia Chapters will be holding a joint meeting at your facility in October. Feel free to contact the chapters in the matter of the survey.

I can, however, recommend the services of our major suppliers to meet your needs in identifying in-plant shops. AM, A. B. Dick, 3M, and others would be glad to cooperate with you, I am certain.

Please let me know if IPMA can be of assistance in this matter.

Sincerely,

C. R. Dillon

C. R. Dillon
Senior Vice President

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F. Anthony Hull – 1976
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Cargill Incorporated
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Minneapolis, MN 55402
612-330-7303
Divisions
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Bank of America - Dept. 3020
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San Francisco, CA 94137
415-622-4892
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Victor Comptometer Corp.
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Chicago, IL 60618
312-539-8210
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Lincoln, NE 68509
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Main Avenue
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203-762-4630
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TRW Systems
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Redondo Beach, CA 90278
213-535-2418
Region 2 – Midwestern Region
Glenn E. Webster – 1976
3M Company
3M Center - Bldg. 216-2N
St. Paul, MN 55101
612-733-4380
Region 3 – Southeastern Region
H. P. Weber – 1977
Pan-American Life Ins. Co.
2400 Canal St.
New Orleans, LA 70160
504-821-2510
Region 4 – Eastern Region
Russell A. Carlson – 1976
Ministry of Gov't Services
Rm. B-511 Whitney Block
Toronto, Ont. M7A 1N8
416-965-5356

CMSU

CENTRAL MISSOURI STATE UNIVERSITY WARRENSBURG, MISSOURI 64093

SCHOOL OF APPLIED SCIENCES
AND TECHNOLOGY
PHONE 816-429-4031

June 13, 1975

Mr. Raymond Campbell, Manager
Printing Industries of Kansas City
702 Midland Building
1221 Baltimore
Kansas City, MO 64105

Dear Mr. Campbell:

In cooperation with the Research Coordinating Unit of the Missouri State Department of Elementary and Secondary Education and Central Missouri State University, we are conducting the Missouri Industrial and Educational Graphic Arts Survey. This research project will attempt to identify the present graphic arts instruction being offered in the secondary schools of Missouri. In addition we will attempt to analyze the current practices in the graphic arts industries in Missouri and use these findings to establish recommended graphic arts curriculum for the secondary schools.

In order to identify the present practices in the graphic arts industries, we hope to obtain information from a sampling of the commercial establishments listed in the 1975 Missouri Directory of Manufacturing and Mining published by the Missouri Division of Commerce and Industrial Development. At times it is rather difficult to identify just which categories of the Standard Industrial Code should be included under the heading of "graphic arts". Does your organization have a list of S.I.C. code numbers which you consider to be graphic arts? If so, please share the list with us. If not, please check those categories on the enclosed sheet which you feel should be included as graphic arts. In addition we wish to identify firms throughout the state which have in-plant printing so that we can include them in our sample. Do you have a directory of industries with in-plant printing facilities for the state of Missouri? Or do you have a suggestion regarding a possible source of this information?

Mr. Mel Blazer, the Kansas City Area educational representative of the Multigraphics Division of Addressograph Multigraph Corporation, has indicated that he could provide a rather comprehensive list of in-plant printing facilities in the Kansas City, St. Louis, and Jefferson City areas. Do you feel that his list is likely to be biased or inadequate? I had initially felt that perhaps a paper or film distributor could give us a sampling which might be adequate. I would appreciate any thoughts which you or other members of your organization could give related to the listing of in-plant facilities in Missouri.

We hope to obtain the cooperation of as many people as possible in the state of Missouri involved in graphic arts education and the graphic arts industries. Since we believe that the study will be influential in establishing graphic arts curriculum at the junior high, senior high, and vocational-technical school levels in Missouri, it should be of significance to graphic arts industries that will hire personnel educated in these schools. We feel that in order to encourage maximum industrial participation, letters of endorsement of the desirability of this study by industrial organizations such as Printing Industries of Kansas City would be helpful. The letters of endorsement we request would in no way require financial involvement and would not necessarily imply support of the findings and recommendations of the study, but would simply be influential in encouraging members of these organizations to participate. Would your organization be willing to endorse the study with such a letter?

In summary, we are requesting your response on three matters: (1) identification of S.I.C. categories which should be included as graphic arts, (2) a directory of in-plant printing facilities in Missouri and (3) a letter endorsing the study we are undertaking. Thank you for any assistance you are able to provide.

Sincerely yours,

Charles E. Keseman
Project Director

Enclosure

CEK/sep

Also sent to:

Dave Jones
Printing Industries of St. Louis
321 Spring Avenue
St. Louis, MO 63108

PIA PRINTING INDUSTRIES ASSOCIATION
KANSAS CITY

Composed of Printers • Lithographers • Envelope Manufacturers
Typographers • Engravers • Electrotypers • Plate Makers • Stereotypers
Paper Merchants • Roller Makers • Ink Manufacturers • Bookbinders
Printing Machinery Suppliers • Letter Shops • Stationers
Box Manufacturers • Label Manufacturers

702 MIDLAND BUILDING KANSAS CITY, MISSOURI 64105
TELEPHONE 816-421-7677

August 5, 1975

Mr. Charles E. Keseman
Project Director
Central Missouri State University
Warrensburg, Missouri 64093

Dear Mr. Keseman:

I apologize for the delay in answering your letter of June 13th. In that letter you requested I identify the SIC catagories which should be included as Graphic Arts. In looking over the list, I did not realize that the Graphic Arts Industry was involved in so many other areas identified under SIC code numbers. It was quite an eye opener in trying to determine if some of these people should be classified in the graphic arts.

In regards to a directory of in-plant printing facilities in Missouri, I know of none available at the present time. There are some groups around the state representing in-plant printing facilities. I believe I put you in contact with a gentleman representing in-plant printers here in Kansas City, Missouri. The primary source for developing such a directory, I would imagine, would best be compiled through information you can receive or obtain from the paper merchants.

The study which you are undertaking is long over due. I do not know of any other area that has undertaken such a study. It is my own personal feeling that although according to census data the Graphic Arts Industry is rather large, I do not feel that it fully presents the picture of the size of those people involved in graphic arts in the state of Missouri. Too often, industries are labeled by the major product they turn out with no recognition that there possibly is a great deal of graphic art people involved in producing the finished product or in aiding the production of an item.

(continued)

RAYMOND J. CAMPBELL
Manager

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C. DIXON VANCE
A. L. ARNOLD, JR., ex officio

Such a study would be of great use to the graphic arts educators in the state in outlining to the students the potential of job opportunities and that such opportunities may not be limited to those listed as printing firms. By noting the need and the potential of job opportunities the curriculum to meet that need could be more fully developed and a better student turned out of the school system to meet that need.

It is encouraging to see someone attempt to determine the actual size and potentialities of this enormous industry. Wishing you success in this undertaking.

Yours truly,

Raymond J. Campbell
Manager

RJC:alc
enclosure

STANDARD INDUSTRIAL CLASSIFICATION (S.I.C.) NUMBERS AND TITLES WHICH SEEM TO BE RELATED TO GRAPHIC ARTS

___	2393	Textile Bags
___	2399	Fabricated Testile Products Not Elsewhere Classified
___	2611	Pulp Mills
___	2621	Paper Mills, Except Building Paper Mills
___	2631	Paperboard Mills
___	2641	Paper Coating and Glazing
✓	2642	Envelopes
X	2643	Bags, Except Textile Bags
___	2645	Die-Cut Paper and Paperboard and Cardboard
___	2647	Sanitary Paper Products
✓	2648	Stationery, Tablets and Related Products
___	2649	Converted Paper and Paperboard Products, Not Elsewhere Classified
✓	2651	Folding Paperboard Boxes
✓	2652	Set-up Paperboard Boxes
___	2653	Corrugated and Solid Fiber Boxes
X	2654	Sanitary Food Containers
X	2655	Fiber Cans, Tubes, Drums, and Similar Products
✓	2711	Newspapers--Publishing, Publishing and Printing
✓	2721	Periodical-Publishing, Publishing and Printing
✓	2731	Books-Publishing, Publishing and Printing
✓	2732	Book Printing
✓	2741	Miscellaneous Publishing
✓	2751	Commercial Printing, Letterpress, and Screen
✓	2752	Commercial Printing, Lithographic
✓	2753	Engraving and Plate Printing
✓	2754	Commercial Printing, Gravure

✓	2761	Manifold Business Forms
✓	2771	Greeting Card Publishing
✓	2782	Blankbooks, Looseleaf Binders and Devices
✓	2789	Bookbinding and Related Work
✓	2791	Typesetting
✓	2793	Photoengraving
✓	2794	Electrotyping and Stereotyping
✓	2795	Lithographic Platemaking and Related Services
✓	2893	Printing Ink
___	3554	Paper Industries Machinery
✓	3555	Printing Trades Machinery and Equipment
✓	3861	Photographic Equipment and Supplies
___	3953	Marking Devices
✓	3993	Signs and Advertising Displays

CENTRAL MISSOURI STATE UNIVERSITY WARRENSBURG, MISSOURI 64093

SCHOOL OF APPLIED SCIENCES
AND TECHNOLOGY
PHONE 816-429-4031

August 5, 1975

Dear :

I am enclosing a copy of the MIEGA Survey form which we plan to mail to all commercial and in-plant printing firms in Missouri. This survey is to identify practices of industry upon which to base a recommended graphic arts curriculum for the secondary schools of Missouri.

At present we have identified over 1400 commercial printing firms in the state; but have had difficulty in identifying the firms which have in-plant facilities. The In-Plant Printing Management Association has endorsed this study and provided several hundred names of in-plant facilities; however, we come to you as a supplier to in-plant firms with the request for a mailing list of other firms we should include in our sample for this survey. We feel that there must be several thousand of these captive plants in the state.

While most surveys of this nature include only commercial firms, we feel that we must also include in-plant firms if we are to describe the total picture of the graphic arts industry. We assure you that only two or three persons (my research assistant, a keypunch operator, and myself) will have access to any list you supply us and we will treat it confidentially. I will be happy to discuss this with you further either in person or by telephone. Feel free to call me at the toll-free number of the University--800-892-2439, Extension 4450.

We feel confident that the findings have real potential for improving the educational offerings in the state which, in turn, may provide better workers for our industries and more informed citizens for our society. Thank you for any assistance you are able to provide.

Sincerely yours,

Charles E. Keseman
Project Director

CEK/sep

EQUAL EDUCATION AND EMPLOYMENT OPPORTUNITY M/F

CENTRAL MISSOURI STATE UNIVERSITY WARRENSBURG, MISSOURI 64093

SCHOOL OF APPLIED SCIENCES
AND TECHNOLOGY
PHONE 816-429-4031

May 1, 1975

Dear :

I am enclosing a draft copy of information forms to be mailed to Missouri industrial education teachers who indicate that they offer graphic arts as part of their industrial education program. This survey is a part of a research study to identify the status of graphic arts in Missouri industry and education in order to improve graphic arts education.

Before mailing this rather lengthy form we need to refine it as much as possible. We value your judgement and ask that you objectively critique the forms and suggest changes which you feel would improve the instrument. We especially need a critical eye to identify possible misunderstandings in the directions or wording of the items as well as identifying omissions or unnecessary content. Perhaps you may wish to complete the information form to aid in your analysis.

In order to reach teachers before summer vacation we need to mail the forms by May 9. Therefore, we request your reaction by May 7. Since the mail may not meet this deadline, I'll plan to phone you on May 8 to get your response. Then you may return the form for our future reference. You may use the enclosed address label and stamps.

Thank you for your kind assistance in this busy time of year.

Sincerely yours,

Charles E. Keseman
Project Director
Missouri Industrial and
Educational Graphic Arts Survey

EQUAL EDUCATION AND EMPLOYMENT OPPORTUNITY M/F

CMSU

SCHOOL OF APPLIED SCIENCES
AND TECHNOLOGY
PHONE 816-429-4031

CENTRAL MISSOURI STATE UNIVERSITY **WARRENSBURG, MISSOURI 64093**

June 30, 1975

Dear :

We are working on a research project this summer to better coordinate the graphic arts educational offerings in the state of Missouri with the employment needs of the graphic arts industries. This Missouri Industrial and Educational Graphic Arts Survey is a cooperative effort with the Research Coordinating Unit of the Missouri State Department of Elementary and Secondary Education and Central Missouri State University.

The first part of the survey analyzed the present educational offerings throughout the secondary schools of Missouri. The second part of the survey will attempt to identify the activities and employment needs of Missouri graphic arts industries. Based upon the findings of these two surveys, a recommended body of graphic arts instructional content will be developed for the junior high, senior high, and vocational-technical schools as part three of the study.

The enclosed form is a rough draft of the form we plan to use for part two of the study--the survey of industry. At this time we are "field testing" the instrument and would appreciate your assistance in analyzing the information form. Please examine the form for format, content, and wording and give us your suggestions on how to make it better. Since the form is so long, please look for places to cut, especially if any parts seem unnecessary or redundant. If the instructions are not entirely clear or if the meaning of any words is not clear, please make notations directly on the form.

Although you may wish to complete the form as you examine it, it is not necessary that you do so.

We would appreciate your immediate response as we hope to begin printing the forms July 8. Thank you for taking time from your busy schedule to assist in providing the most relevant education possible for future graphic arts employees in our state.

Sincerely yours,

Charles E. Keseman
Project Director

CEK/sep

EQUAL EDUCATION AND EMPLOYMENT OPPORTUNITY M/F

APPENDIX D

Education Short Information Form

Cover Letter For Follow-up Mailing of Short Form

Cover Letter For Education Long Information Forms

Education Form I--Graphic Arts Instructor

Education Form II--General Information On Graphic Arts Offerings

Education Form III--Graphic Arts Course Content

Industry Information Form

Follow-up Letter to Industry Information Forms

Cover Letter For Follow-up Mailing of Industry Information Forms

MISSOURI
INDUSTRIAL AND EDUCATIONAL
GRAPHIC ARTS SURVEY

CMSU
CENTRAL MISSOURI STATE UNIVERSITY

CHARLES E. KESEMAN, PROJECT DIRECTOR

GRAPHICS DEPARTMENT
WARRENSBURG, MO 64093
(816) 429-4453

April 4, 1975

Dear Industrial Education Instructor:

In cooperation with the Research Coordinating Unit of the Missouri State Department of Elementary and Secondary Education and Central Missouri State University, we are currently conducting a study of the graphic arts curricular offerings in the secondary schools of the state. Of course any time a statewide study in education is taken, it is very important to obtain data from each secondary school. We need one response from each school. If another instructor in your school is better qualified to complete this form, please pass it to him. Will you take a few minutes right now to answer the following questions, thus helping to identify the present graphic arts offerings in the Missouri schools?

Thank you for your professional assistance in providing the finest education possible for the young people of Missouri. After the study has been completed, the findings will be available through Mr. B. Eugene Brightwell, State Supervisor of Industrial Arts: tentative completion date is August 31, 1975.

Sincerely yours,

Charles E Keseman
Charles E. Keseman
Project Director

Richard F. Guantone
Richard F. Guantone
Research Assistant

INFORMATION FORM

For purposes of our study, graphic arts instruction includes photography, printing, binding, and any related instruction either as units within a general course or as separate courses.

☐ 1. If you offer no instruction in graphic arts in your school check the box to the left.

☐ 2. If you presently offer no graphic arts instruction but plan to start some graphic arts instruction in the next two years check the box to the left.

☐ 3. If you know of any graphic arts activities provided in other departments of your school (such as art or business) please check the box to the left.

If graphic arts instruction is offered in your school please answer the following questions by checking all responses which apply to the graphic arts instruction in your school.

4. How is graphic arts instruction included in your industrial education program?
   - ☐ We offer one or more units of graphic arts instruction within a general shop or exploratory industrial arts course. (level I—orientation)
   - ☐ We offer a general graphic arts course. (level II—exploration)
   - ☐ We offer specialized graphic arts courses. (level III—specialization)
   - ☐ We offer vocational-technical courses in graphic arts. (occupational preparation)

5. At what grade level(s) is/are graphic arts instruction offered at your school?
   GRADE ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐ 12

6. How many students are receiving some instruction in graphic arts at your school each year? ________ students

370

7. Please list all instructors who currently teach some graphic arts content beside your school mailing label on the reverse side: also make necessary corrections on the mailing label.

please tape to close

FIRST CLASS
PERMIT NO. 42
Warrensburg,
Missouri
64093

BUSINESS REPLY MAIL
No Postage Stamp Necessary If Mailed in the United States

Postage to be paid by:

MIEGA Survey
Mr. Richard Guantone
Graphics Department
Central Missouri State University
Warrensburg, MO 64093

Missouri Industrial and Educational Graphic Arts Survey
Graphics Department
Central Missouri State University
Warrensburg, MO 64093

address correction requested

Non-Profit Organization
U. S. POSTAGE
PAID
Permit No. 102
Warrensburg, Mo.

Your reply is important to the advancement of public education in Missouri

MISSOURI
INDUSTRIAL AND EDUCATIONAL
GRAPHIC ARTS SURVEY

CENTRAL MISSOURI STATE UNIVERSITY

CHARLES E. KESEMAN, PROJECT DIRECTOR

GRAPHICS DEPARTMENT
WARRENSBURG, MO 64093
(816) 429-4453

April 30, 1975

Dear Industrial Education Instructor:

Approximately three weeks ago you were sent an information form related to the Missouri Industrial and Educational Graphic Arts Survey. As of this date we have not received a response from you. We know this is a busy time of year; however, in order to get a complete picture of the status of graphic arts in Missouri we would like a response from each school which offers industrial education. We want to include your response in the study.

So if the form was lost in the mail, if you have laid the form aside, or if you felt that we didn't need your responses for some reason, we are enclosing another copy of the form. Won't you complete the form and mail it back right away? We would like to complete this portion of the study before school is out (by May 12 if possible).

Simply complete the form, fold your mailing label to the inside, tape where it is indicated and mail. NO POSTAGE IS REQUIRED.

If you have returned the first form; but removed the portion with your mailing label, we were unable to identify your return. Please return another form and mark it "Duplicate: Label Removed on First Form".

Thank you for your assistance.

Sincerely yours,

Charles E. Keseman
Charles E. Keseman
Project Director

Richard F. Guantone
Richard F. Guantone
Research Assistant

**MISSOURI
INDUSTRIAL AND EDUCATIONAL
GRAPHIC ARTS SURVEY**

CENTRAL MISSOURI STATE UNIVERSITY

CHARLES E. KESEMAN, PROJECT DIRECTOR

**GRAPHICS DEPARTMENT
WARRENSBURG, MO 64093
(816) 429-4453**

May 7, 1975

Dear Graphic Arts Instructor:

Recently, you completed a one-page information form related to the Missouri Industrial and Educational Graphic Arts Survey being conducted as a cooperative venture between the Research Coordinating Unit of the Missouri State Department of Elementary and Secondary Education and Central Missouri State University. Your response indicated that graphic arts instruction was being offered within the industrial education curriculum at your school. You are now being asked for more detailed responses in order to provide an accurate picture of the present scope of graphic arts instruction in the secondary public schools of Missouri. Since the number of graphic arts programs in Missouri is limited, it is very important that responses be received from instructors in each of the existing programs.

Form I in the packet relates directly to the teacher and should be completed by each graphic arts instructor in your school. Form II relates to the general aspects of your graphic arts program and should be completed by the most knowledgable person for each school facility. Finally, Form III relates directly to the instructional content offered in each course and should be completed by the most knowledgable person for each school facility. Please distribute a copy of Form I to each of the other graphic arts instructors in your school facility and have them return it to you, and in turn, would you please mail it back to Central Missouri State University? If someone else can better answer parts of Forms II and/or III, please ask them for assistance. Therefore, a condensed list of instructions follows:

1. Form I--Graphic Arts Instructor (one per teacher)
2. Form II--General Information on Graphic Arts Offerings (one per school facility)
3. Form III--Graphic Arts Course Content (one per course)

We realize that you have a very busy schedule at this time of year, but won't you take some time now to complete the three parts? You may be assured that all responses will remain confidential and no school or individual will be identified in the final report. Please send all completed instruments in the stamped self-addressed envelope by June 10, 1975. Thank you for your assistance; the best possible education for the young people of Missouri is our goal.

Sincerely yours,

Charles E. Keseman
Charles E. Keseman
Project Director

Richard F. Guantone
Richard F. Guantone
Research Assistant

FORM I: GRAPHIC ARTS INSTRUCTOR

(This form should be completed by each graphic arts instructor in your school.)

The total number of graphic arts instructors in this school facility is____________________.[1]

Instructor's name[2] ____

Name of school[3] ____

Instructor's age[4] ________

A. DEGREES

If you have NO degree, how many semester hours of college credit have you completed?[5] ____________

Please write in data related to the degrees you have earned.

	Associate	Bachelors	Masters	Advanced
Name of degree	[6] __________	[7] __________	[8] __________	[9] __________
Institution awarding degree	[10] __________	[11] __________	[12] __________	[13] __________
Major(s)	[14] __________	[15] __________	[16] __________	[17] __________
Minor(s)-	[18] __________	[19] __________	[20] __________	[21] __________
Semester hours in graphic arts	[22] __________	[23] __________	[24] __________	[25] __________

B. TEACHING EXPERIENCE

Please write in the number of years of teaching experience you have, including 1974-75.

In this school[26] ________ years In teaching graphic arts[27] ________ years Total teaching experience[28] ________ years

C. INDUSTRIAL WORK EXPERIENCE

_____[29] Please check if you have NO previous work experience in industry.

Please write in the number of months of industrial experience you have.

In industries related to graphic arts[30] ________ months In other industries[31] ________ months

D. OTHER IN-SERVICE EXPERIENCE

List significant in-service or related experiences which have increased your graphic arts teaching competences (other than above degrees or work experience)[32]

____

____

____

____

What future experiences could most assist you in becoming a better teacher?[33]

____

____

____

____

What courses would you take if available?[34]

____

____

____

____

FORM II: GENERAL INFORMATION ON GRAPHIC ARTS OFFERINGS

(This form should be completed by one instructor per school facility)

School ________________________________[15]

A. CURRICULUM

Please describe the courses in your school facility in which graphic arts is taught.

Name of courses[16]	Total number of sections per semester[17]	Total number of clock hours class meets[18]	Total number of students per semester[19]	Grade levels[40]

What changes in your graphic arts curriculum have occurred in the past two years? (Check those which apply)

_____ *No change.*[41]
_____ *Began instruction in graphic arts.*[42]
_____ *New courses added. (Specify)*[43] ________________________________
_____ *Content within courses changed. (Specify)*[44] ________________________________
_____ *Courses deleted. (Specify)*[45] ________________________________
_____ *Other: (Specify)*[46] ________________________________

What curricular changes in graphic arts do you plan during the next two years? (Please enumerate)[47]

____

____

____

Are additional graphic arts teachers needed in your school building in the next two years if all anticipated curricular changes are accepted within the district?[48] _____ *Yes* _____ *No* *If yes, how many?* _______[49]

B. GRAPHIC ARTS PRODUCTION AND INSTRUCTION

What instruction-production graphic arts responsibilities do instructors have in your school? (Check one)[50]

_____ *Instruction only. (If you checked this response , go to response n)*
_____ *Production and instruction combined daily.*
_____ *Full-time production in summer only.*
_____ *Instruction plus supervision of paid student production workers.*
_____ *Instruction plus supervision of full-time production workers.*
_____ *Instructon plus supervision of production performed by advanced students as appropriate class activities.*
_____ *Other: (Please describe)* ________________________________

Percent of instructor time involved in production activities? (Check one)[51]

_____ *25% or less* _____ *26-50%* _____ *51-75%* _____ *76-100%*

If production work is done in your graphic arts lab, what effect does it have on your instruction? (Check one)[52]

_____ *Production is significant aid to instruction.*
_____ *Production is some aid to instruction.*
_____ *Little effect on instruction.*
_____ *Production is some hinderance to instruction.*
_____ *Production is great hinderance to instruction.*

Please identify types of production work done in your school. (Check those which apply)

____ *Print school paper.*[53]
____ *Print school yearbook.*[54]
____ *Print administrative forms.*[55]
____ *Print pamplets, brochures, and booklets.*[56]
____ *Print programs, tickets, and posters.*[57]
____ *Photography for school paper.*[58]
____ *Photography for school yearbook.*[59]
____ *Printing work for other instructors.*[60]
____ *List others:*[61] ________________________________

Check those graphic arts processes which are done in your production laboratory.

____ *Design and Layout*[62]
____ *Image Generation (Set copy)*[63]
____ *Image Assembly (Paste up or Imposition)*[64]
____ *Image Carrier Preparation (Platemaking, adhering stencils)*[65]
____ *Image Transfer: Offset Printing*[66]
____ *Image Transfer: Letterpress Printing*[67]
____ *Image Transfer: Screen Printing*[68]
____ *Image Transfer: Stencil (Mimeograph) Printing*[69]
____ *Image Transfer: Hot Stamp Printing*[70]
____ *Binding and Finishing (Trimming, collating, stitching, padding, drilling, perforating, etc.)*[71]
____ *Other: (Specify)*[72] ________________________________

Do you recommend the use of production jobs as learning experiences for your students? (Check one)[73]

____ *Positively yes* ____ *In some instances, yes* ____ *Positively no*

C. MAJOR EQUIPMENT

Indicate how many of each of these major pieces of equipment you have in your school graphic arts laboratory.

How many?
____ *Type banks and foundry type*[74]
____ *Imposition stones*[75]
____ *Strike-on text system*[76]
____ *Computerized phototypesetter (any type sizes: text or display)*[77]
____ *Non-computerized phototypesetter (any type sizes: text or display)*[78]
____ *Tape perforator*[79]
____ *Vertical process camera*[80]
____ *Horizontal process camera*[81]
____ *Temperature control sink*[82]
____ *Contact printer for photography or contact frame for graphic arts*[83]
____ *Offset press or duplicator (less than 14 x 20)*[84]
____ *Offset press (14 x 20 or larger)*[85]
____ *Hand operated platen press (pilot)*[86]
____ *Hand-fed power platen press*[87]
____ *Auto-fed power platen press*[88]
____ *Auto-fed power cylinder press*[89]
____ *Proof press*[90]
____ *Hot stamping press*[91]
____ *Hand-fed power screen press*[92]

How many?
____ *Auto-fed power screen press*[93]
____ *Drying rack*[94]
____ *Linotype*[95]
____ *Monotype*[96]
____ *Ludlow*[97]
____ *Power miter saw*[98]
____ *Plate maker (exposure unit)*[99]
____ *Light tables*[100]
____ *Precision line-up table*[101]
____ *Folder*[102]
____ *Collator*[103]
____ *Stitcher*[104]
____ *Paper drill*[105]
____ *Manual paper cutter*[106]
____ *Power paper cutter*[107]
____ *Others (please list)*[108] ________________________________

What changes in equipment have occurred in the past two years?

Deleted:[109] __________________________________

____

Added:[110] __________________________________ *Estimated cost:* $ ______________[111]

____

Traded:[112] __________________________________ *Estimated cost:* $ ______________[113]

____

What changes in equipment are planned for the next two years?

Deleted:[114] __________________________________

____

Added:[115] __________________________________ *Estimated cost:* $ ______________[116]

____

Traded:[117] __________________________________ *Estimated cost:* $ ______________[118]

____

D. GRAPHIC ARTS PROGRAM FINANCING

Which method best describes the financing of your graphic arts instructional program? (Check one)[119]

______ *Production profits finance instructional supplies and capital equipment.*

______ *Students pay for supplies: District pays for capital equipment.*

______ *District pays for supplies and capital equipment.*

______ *Students and district share supply expenses: District pays for capital equipment.*

______ *Other: (Explain)* __________________________________

If your program is financed at least in part by your local district, what approximate amount of local funds is provided annually for supplies? $ __________[120] *For equipment?* $ __________[121]

What approximate percent of your graphic arts program is supported by federal-state vocational funds?[122] __________%

E. PROGRAM EVALUATION

What do you consider to be the three principal strengths of your graphic arts program?[123]

____

____

____

What do you consider to be the three greatest weaknesses of your graphic arts program?[124]

____

____

____

FORM III: GRAPHIC ARTS COURSE CONTENT

(This form should be completed for each graphic arts course offered at your school facility.)

Course Title[125] ______________________________

School[126] ______________________________

A. COURSE LEVEL

Please check the response which best describes the grade level and general intent of this course.[127]

_____Graphic arts instruction within a general shop or exploratory industrial arts course. (Level I—orientation)

_____General graphic arts course. (Level II—exploration)

_____Specialized graphic arts courses. (Level III—specialization)

_____Vocational-technical course in graphic arts. (occupational preparation)

B. COURSE OBJECTIVES

Please rank those objectives which you accept for this course, with number 1 being the highest rank.

Rank

_____Acquaint students with graphic arts careers.[128]

_____Develop student interest in graphic arts.[129]

_____Build special skills in one area of graphic arts.[130]

_____Provide job entry skill in a specific graphic arts job.[131]

_____Provide job entry skill in a cluster of graphic arts occupations.[132]

_____Provide exploratory experiences in graphic arts occupational clusters.[133]

_____Prepare students for college to pursue majors related to graphic arts.[134]

_____Help students to become better consumers of graphic arts products.[135]

_____Others:[136] ______________________________

_____ ______________________________

C. COURSE CONTENT

Please write in the approximate number of class periods you devote to each major topic in this course.

Number of Class Periods for Topic	Major Topics of Instruction
_______	Graphic Arts Industry--Past, Present, Future[137]
_______	Career and Job Orientation[138]
_______	Safety[139]
_______	Design and Layout[140]
_______	Image Generation (set copy)[141]
_______	Image Assembly (paste-up, impositon)[142]
_______	Image Carriers (platemaking, adhering stencils)[143]
_______	Image Transfer[144]
_______	Finishing and Binding Operations[145]
_______	Ink and Paper[146]
_______	Management[147]
_______	Laws[148]

_______Total number of class periods in this course[149]

_______Number of minutes per class period.[150]

What approximate percent of the total class time in this course in devoted to each of the following principal reproduction processes?

________% Relief Printing (letterpress, hot stamping, rubber stamp, flexography, etc.)^{151}
________% Planographic Printing (offset lithography, etc.)^{152}
________% Stencil Printing (screen process , mimeograph, etc.)^{153}
________% Intaglio Printing (gravure, engraving, etc.)^{154}
100% Total

D. COURSE INSTRUCTIONAL TOPICS

The following are some instructional units or topics which may be included in your graphic arts course. For each topic circle one of the numbers (0, 1, 2, 3, or 4) on the left to indicate the extent of coverage for that topic in this class. The following response key will be used in the remainder of this information form to indicate the extent of coverage for each instructional topic.

RESPONSE KEY

0—None; not covered in this class
1—Mentioned; brief coverage, less than average
2—Moderate; average coverage, generally at a level with major portion of course
3—Considerable; more than normal coverage
4—Extensive; maximum coverage in time available

Extent of Coverage	Instructional Topic
(circle one)	GRAPHIC ARTS: PAST, PRESENT, FUTURE
0 1 2 3 4	History of Graphic Arts and Printing Industry^{155}
0 1 2 3 4	Size and scope of the graphic arts industry^{156}
0 1 2 3 4	Trends in present-day graphic arts industries^{157}
0 1 2 3 4	Future outlook for graphic arts industries^{158}
0 1 2 3 4	Others ^{159} ________
(circle one)	CAREER AND JOB ORIENTATION
0 1 2 3 4	Job opportunities and job titles in the graphic arts industry^{160}
0 1 2 3 4	Personal qualifications for graphic arts occupations (education, skills, physical attributes)^{161}
0 1 2 3 4	Duties of workers in graphic arts occupations^{162}
0 1 2 3 4	Working conditions, earnings, and employee job satisfaction in graphic arts occupations^{163}
0 1 2 3 4	Trends in graphic arts occupations^{164}
0 1 2 3 4	Others^{165} ________
(circle one)	SAFETY
0 1 2 3 4	Principal safety rules and regulations of the graphic arts industry^{166}
0 1 2 3 4	Specific safety rules and regulations related to hazardous equipment and operations^{167}
0 1 2 3 4	Laws concerning safety in industry^{168}
0 1 2 3 4	First aid action following an accident or other emergency^{169}
0 1 2 3 4	Others^{170} ________
(circle one)	DESIGN AND LAYOUT
0 1 2 3 4	Value of planning, designing, and layout^{171}
0 1 2 3 4	Basic design elements and principles^{172}
0 1 2 3 4	Basic principles of color^{173}
0 1 2 3 4	Point system of measurement^{174}
0 1 2 3 4	Metric system of measurement^{175}
0 1 2 3 4	Thumbnail sketches.^{176}
0 1 2 3 4	Rough Layout^{177}
0 1 2 3 4	Comprehensive page and signature layout—dummy^{178}
0 1 2 3 4	Type styles^{179}
0 1 2 3 4	Copyfitting^{180}
0 1 2 3 4	Others^{181} ________

RESPONSE KEY

0—None; not covered in this class

1—Mentioned; brief coverage, less than average

2—Moderate; average coverage, generally at a level with major portion of cours

3—Considerable; more than normal coverage

4—Extensive; maximum coverage in time available

Extent of Coverage **Instructional Topic**

(circle one) **IMAGE GENERATION**

Planography

0 1 2 3 4 Methods of cold type composition.[182]

0 1 2 3 4 Strike-on composition.[183]

0 1 2 3 4 Dry transfer composition.[184]

0 1 2 3 4 Preprinted art, clip art.[185]

0 1 2 3 4 Phototypesetting display copy.[186]

0 1 2 3 4 Phototypesetting text copy.[187]

0 1 2 3 4 Computer typesetter (CRT, magnetic tape, or punched tape)[188]

0 1 2 3 4 Others[189] ______________________________

Relief

0 1 2 3 4 Methods of hot type composition[190]

0 1 2 3 4 Line length and leading.[191]

0 1 2 3 4 Foundry and wood type.[192]

0 1 2 3 4 Spacing.[193]

0 1 2 3 4 Letter casting machines.[194]

0 1 2 3 4 Line casting machines.[195]

0 1 2 3 4 Remelting equipment for metal casting.[196]

0 1 2 3 4 Miter saw.[197]

0 1 2 3 4 Others[198] ______________________________

Intaglio

0 1 2 3 4 Methods of generating images for gravure and engraving.[199]

0 1 2 3 4 Others.[200] ______________________________

Stencil Process

0 1 2 3 4 Techniques used to generate images in screen printing.[201]

0 1 2 3 4 Techniques used to generate images in mimeograph.[202]

0 1 2 3 4 Others.[203] ______________________________

Continuous Tone Photography

0 1 2 3 4 Types of cameras.[204]

0 1 2 3 4 Parts of a camera.[205]

0 1 2 3 4 Principles of black and white photography.[206]

0 1 2 3 4 Principles of color photography.[207]

0 1 2 3 4 Determining proper exposure.[208]

0 1 2 3 4 Film development.[209]

0 1 2 3 4 Color developing.[210]

0 1 2 3 4 Finishing and mounting prints.[211]

0 1 2 3 4 Color enlarging.[212]

0 1 2 3 4 Contact printing.[213]

0 1 2 3 4 Projection printing.[214]

0 1 2 3 4 Filters.[215]

0 1 2 3 4 Light exposure meters.[216]

0 1 2 3 4 Artificial lighting.[217]

0 1 2 3 4 Special effects.[218]

0 1 2 3 4 Others[219] ______________________________

RESPONSE KEY

0--None: not covered in this class

1--Mentioned: brief coverage, less than average

2--Moderate: average coverage, generally at a level with major portion of course

3--Considerable: more than normal coverage

4--Extensive: maximum coverage in time available

Extent of Coverage	Instructional Topic
	Process Camera
0 1 2 3 4	Types of process cameras.[120]
0 1 2 3 4	Basic parts of a process camera.[121]
0 1 2 3 4	Making a line negative.[122]
0 1 2 3 4	Types of film.[123]
0 1 2 3 4	Darkroom techniques.[124]
0 1 2 3 4	Making a contact print.[125]
0 1 2 3 4	Use of a stepped gray scale.[126]
0 1 2 3 4	Theory of densitometry.[127]
0 1 2 3 4	Light and filter theory.[128]
0 1 2 3 4	Computing halftone exposure.[129]
0 1 2 3 4	Making a halftone negative.[130]
0 1 2 3 4	Screen angles and types of screens.[131]
0 1 2 3 4	Process color separation.[132]
0 1 2 3 4	Shooting copy for posterization.[133]
0 1 2 3 4	Shooting copy for duotone.[134]
0 1 2 3 4	Diffusion transfer.[135]
0 1 2 3 4	Equipment and materials used in stripping.[136]
0 1 2 3 4	Stripping a single page, single color flat.[137]
0 1 2 3 4	Stripping a multiple page, single color flat.[138]
0 1 2 3 4	Stripping a multiple color flat.[139]
0 1 2 3 4	Others.[140] ____________________
(circle one)	**IMAGE ASSEMBLY**
	Relief
0 1 2 3 4	Tools and equipment used for lockup.[141]
0 1 2 3 4	Procedures used to lockup a form.[142]
0 1 2 3 4	Imposition of signatures.[143]
0 1 2 3 4	Others.[144] ____________________
	Planography
0 1 2 3 4	Instruments, equipment and tools used in copy preparation.[145]
0 1 2 3 4	Making a mechanical. (paste-up)[146]
0 1 2 3 4	Cropping and scaling art work for camera.[147]
0 1 2 3 4	Use of register marks.[148]
0 1 2 3 4	Mechanicals for multi color reproduction.[149]
0 1 2 3 4	Imposition of signatures.[150]
0 1 2 3 4	Others.[151] ____________________
	Intaglio.
0 1 2 3 4	Imposition for gravure.[152]
0 1 2 3 4	Imposition for engraving.[153]
0 1 2 3 4	Others.[154] ____________________
	Stencil.
0 1 2 3 4	Imposition for screen printing.[155]
0 1 2 3 4	Others.[156] ____________________

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3--Considerable: more than normal coverage

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Extent of Coverage	Instructional Topic
	Proofing
0 1 2 3 4	Proofreading marks and procedures.[257]
0 1 2 3 4	Proofing methods used in relief printing.[258]
0 1 2 3 4	Proofing methods used in intaglio printing.[259]
0 1 2 3 4	Proofing methods used in planographic printing.[260]
0 1 2 3 4	Proofing methods used in stencil printing.[261]
0 1 2 3 4	Others.[262] ____________________
(circle one)	IMAGE CARRIERS
	Relief
0 1 2 3 4	Lock form in chase.[263]
0 1 2 3 4	Characteristics and uses of photoengravings.[264]
0 1 2 3 4	Electronic engraving.[265]
0 1 2 3 4	Stereotypes and electrotypes.[266]
0 1 2 3 4	Nonmetallic photosensitive image carriers.[267]
0 1 2 3 4	Rubber and thermoplastic image carriers.[268]
0 1 2 3 4	Others.[269] ____________________
	Planography
0 1 2 3 4	Equipment and tools used in platemaking.[270]
0 1 2 3 4	Making an offset plate.[271]
0 1 2 3 4	Procedures for step and repeat.[272]
0 1 2 3 4	Different types of plates used.[273]
0 1 2 3 4	Correcting plates.[274]
0 1 2 3 4	Preserving and storing plates.[275]
0 1 2 3 4	Spirit duplication.[276]
0 1 2 3 4	Others.[277] ____________________
	Intaglio
0 1 2 3 4	Engraving.[278]
0 1 2 3 4	Gravure metal cylinder.[279]
0 1 2 3 4	Electrically engraved plate.[280]
0 1 2 3 4	Other.[281] ____________________
	Stencil
0 1 2 3 4	Screen materials available.[282]
0 1 2 3 4	Attaching screen to frame.[283]
0 1 2 3 4	Adhering stencils.[284]
0 1 2 3 4	Lacquer base hand-cut stencil.[285]
0 1 2 3 4	Water base hand-cut film.[286]
0 1 2 3 4	Indirect photographic film.[287]
0 1 2 3 4	Direct photographic emulsion.[288]
0 1 2 3 4	Paper stencil.[289]
0 1 2 3 4	Tusche.[290]
0 1 2 3 4	Cleaning screens.[291]
0 1 2 3 4	Mimeograph stencil.[292]
0 1 2 3 4	Others.[293] ____________________

RESPONSE KEY

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3–Considerable: more than normal coverage

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Extent of Coverage — Instructional Topic

(circle one)

IMAGE TRANSFER

0 1 2 3 4 Major printing processes.[194]

0 1 2 3 4 Others.[195] ____________________

Relief

0 1 2 3 4 Types of relief presses.[196]

0 1 2 3 4 Principles of relief printing [197]

0 1 2 3 4 Advantages and disadvantages of relief printing.[198]

0 1 2 3 4 Characteristics of relief printing.[199]

0 1 2 3 4 Others.[200] ____________________

Relief–Letterpress

0 1 2 3 4 Basic principles of letterpress printing.[201]

0 1 2 3 4 Prepress operations in letterpress.[202]

0 1 2 3 4 Postpress operations in letterpress.[203]

0 1 2 3 4 Operations and controls in letterpress.[204]

0 1 2 3 4 Hairline registration.[205]

0 1 2 3 4 Makeready.[206]

0 1 2 3 4 Cleanup procedures.[207]

0 1 2 3 4 Proper care and use of rollers.[208]

0 1 2 3 4 Hand-fed, hand-operated platen press.[209]

0 1 2 3 4 Hand-fed, power-operated platen press.[210]

0 1 2 3 4 Automatic-fed, power-operated platen press.[211]

0 1 2 3 4 Hand-fed, power-operated cylinder press.[212]

0 1 2 3 4 Automatic-fed, power-operated cylinder press.[213]

0 1 2 3 4 Sheet-fed rotary press.[214]

0 1 2 3 4 Web-fed rotary press.[215]

0 1 2 3 4 Operation of proof presses.[216]

0 1 2 3 4 Maintenance and care of a proof press.[217]

0 1 2 3 4 Embossing on a press.[218]

0 1 2 3 4 Numbering on a press.[219]

0 1 2 3 4 Others.[220] ____________________

Relief–Flexography

0 1 2 3 4 Basic theory of the flexographic process.[221]

0 1 2 3 4 Operation of flexography presses.[222]

0 1 2 3 4 Characteristics of flexographic printing.[223]

0 1 2 3 4 Maintenance and care of flexographic presses.[224]

0 1 2 3 4 Others.[225] ____________________

Relief–Letterset (Dry Offset)

0 1 2 3 4 Principles of letterset printing.[226]

0 1 2 3 4 Supplies and materials used in letterset.[227]

0 1 2 3 4 Steps of operations in letterset.[228]

0 1 2 3 4 Letterset presses.[229]

0 1 2 3 4 Ink theory and applicationfor letterset.[230]

0 1 2 3 4 Roller and blanket care and maintenance.[231]

0 1 2 3 4 Feed systems.[232]

0 1 2 3 4 Delivery systems.[233]

0 1 2 3 4 Others.[234] ____________________

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Extent of Coverage	Instructional Topic
	Relief–Thermography
0 1 2 3 4	Equipment and supplies used in thermography.[335]
0 1 2 3 4	Operation of a thermographic machine.[336]
0 1 2 3 4	Other.[337] __________
	Relief–Hot Stamping
0 1 2 3 4	Equipment and supplies for hot stamping.[338]
0 1 2 3 4	Principles of hot stamping.[339]
0 1 2 3 4	Operation of a hand-operated hot stamping press.[340]
0 1 2 3 4	Operation of an automatic hot stamping press.[341]
0 1 2 3 4	Others.[342] __________
	Relief–Rubber Stamping
0 1 2 3 4	Theory of rubber stamp making.[343]
0 1 2 3 4	Rubber stamp materials and equipment.[344]
0 1 2 3 4	Others.[345] __________
	Planography
0 1 2 3 4	History of planography.[346]
0 1 2 3 4	Characteristics of planography.[347]
0 1 2 3 4	Advantages and disadvantages of planographic printing.[348]
0 1 2 3 4	Others.[349] __________
	Planography–Offset lithography
0 1 2 3 4	Theory of offset lithography.[350]
0 1 2 3 4	Principal systems on an offset press.[351]
0 1 2 3 4	Press preparation and operating adjustments.[352]
0 1 2 3 4	Cleaning the press.[353]
0 1 2 3 4	Offset press care and maintenance.[354]
0 1 2 3 4	Print on a one-color, sheet-fed press.[355]
0 1 2 3 4	Print on a multi-color, sheet-fed press.[356]
0 1 2 3 4	Print on a perfecting press.[357]
0 1 2 3 4	Print on a stream-fed press.[359]
0 1 2 3 4	Print on a web-fed press.[360]
0 1 2 3 4	Others.[361] __________
	Planography–Spirit duplicating
0 1 2 3 4	Principles of spirit duplicating.[362]
0 1 2 3 4	Care and maintenance of a spirit duplicator.[363]
0 1 2 3 4	Others.[364] __________
	Intaglio
0 1 2 3 4	Theory of gravure presses.[366]
0 1 2 3 4	Operation of a sheet-fed gravure press.[367]
0 1 2 3 4	Operation of a rotogravure press.[368]
0 1 2 3 4	Maintenance and care of gravure presses.[369]
0 1 2 3 4	Clean a gravure press.[370]
0 1 2 3 4	Others.[371] __________

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Extent of Coverage	Instructional Topic
	Stencil–Screen
0 1 2 3 4	Theory of screen printing.[372]
0 1 2 3 4	Types of surfaces to receive a screened image.[373]
0 1 2 3 4	Procedures for screen printing.[374]
0 1 2 3 4	Inks and block-out materials.[375]
0 1 2 3 4	Procedures for making a screen frame.[376]
0 1 2 3 4	Supplies and materials for screen printing.[377]
0 1 2 3 4	Clean up procedures.[378]
0 1 2 3 4	Methods of drying screen inks.[379]
0 1 2 3 4	Operating a hand-fed, screen printing press.[380]
0 1 2 3 4	Operating an automatic-fed, power-operated screen printing press.[381]
0 1 2 3 4	Others.[382] ____________________
	Stencil–Mimeograph
0 1 2 3 4	Principles of the mimeograph process.[383]
0 1 2 3 4	Operation of a mimeograph machine.[384]
0 1 2 3 4	Care and maintenance of a mimeograph machine.[385]
0 1 2 3 4	Cleaning a mimeograph machine.[386]
0 1 2 3 4	Types of office copiers.[387]
0 1 2 3 4	Others.[388] ____________________
(circle one)	**FINISHING AND BINDING OPERATIONS.**
	Finishing Operations
0 1 2 3 4	Uses, principles and methods of cutting.[389]
0 1 2 3 4	Uses, principles and methods of folding.[390]
0 1 2 3 4	Uses, principles and methods of scoring.[391]
0 1 2 3 4	Uses, principles and methods of perforating.[392]
0 1 2 3 4	Uses, principles and methods of gathering.[393]
0 1 2 3 4	Uses, principles and methods of sorting.[394]
0 1 2 3 4	Uses, principles and methods of punching and drilling.[395]
0 1 2 3 4	Uses, principles and methods of die cutting.[396]
0 1 2 3 4	Uses, principles and methods of laminating.[397]
0 1 2 3 4	Uses, principles and methods of padding.[398]
0 1 2 3 4	Uses, principles and methods of wrapping.[399]
0 1 2 3 4	Hand-operated paper cutter.[400]
0 1 2 3 4	Power paper cutter.[401]
0 1 2 3 4	Programable power paper cutter.[402]
0 1 2 3 4	Automatic folder.[403]
0 1 2 3 4	Scoring on a folder.[404]
0 1 2 3 4	Scoring on a press.[405]
0 1 2 3 4	Perforating on a folder.[406]
0 1 2 3 4	Perforating on a press.[407]
0 1 2 3 4	Automatic gathering machines.[408]
0 1 2 3 4	Automatic sorting machines.[409]
0 1 2 3 4	Paper drills.[410]
0 1 2 3 4	Die cutting on a press.[411]
0 1 2 3 4	Laminating presses.[412]
0 1 2 3 4	Procedures in padding.[413]
0 1 2 3 4	Automatic wrapping machines.[414]
0 1 2 3 4	Wire stitchers.[415]
0 1 2 3 4	Automatic addressing machines.[416]
0 1 2 3 4	Others.[417] ____________________

RESPONSE KEY

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3--Considerable; more than normal coverage

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Extent of Coverage	Instructional Topic
	Binding Operations
0 1 2 3 4	Industrial bindery operations.[419]
0 1 2 3 4	Methods of binding.[420]
0 1 2 3 4	Types of book bindings.[421]
0 1 2 3 4	Parts of a book.[422]
0 1 2 3 4	Bookbinding supplies and equipment.[423]
0 1 2 3 4	Operating principles of bookbindingmachines.[424]
0 1 2 3 4	Others.[425] ______________________________
(circle one)	INKS AND PAPERS
	Inks
0 1 2 3 4	History of inks.[426]
0 1 2 3 4	Types of inks.[427]
0 1 2 3 4	Composition of ink.[428]
0 1 2 3 4	Principles of ink manufacturing.[429]
0 1 2 3 4	Mixing inks.[430]
0 1 2 3 4	Ink mixing systems.[431]
0 1 2 3 4	Correcting for varying ink conditions.[432]
0 1 2 3 4	Selecting inks for specific jobs.[433]
0 1 2 3 4	Others.[434] ______________________________
	Papers
0 1 2 3 4	History of paper and papermaking.[435]
0 1 2 3 4	Kinds of papers.[436]
0 1 2 3 4	Basis weight of paper.[437]
0 1 2 3 4	Paper finishes and special treatments.[438]
0 1 2 3 4	Processes used to make paper.[439]
0 1 2 3 4	Standard sizes of paper.[440]
0 1 2 3 4	Grain and its effect in printing.[441]
0 1 2 3 4	Chemical composition of paper.[442]
0 1 2 3 4	Specifying and ordering paper.[443]
0 1 2 3 4	Using a stock cutting sheet.[444]
0 1 2 3 4	Others.[445] ______________________________
(circle one)	MANAGEMENT
0 1 2 3 4	Functions of management in graphic arts.[446]
0 1 2 3 4	Levels of management.[447]
0 1 2 3 4	Need for management in the graphic arts industries.[448]
0 1 2 3 4	Characteristics of a small printing firm.[449]
0 1 2 3 4	Characteristics of a large printing firm.[450]
0 1 2 3 4	Characteristics of newspaper printing firms.[451]
0 1 2 3 4	Requirements and duties of a manager.[452]
0 1 2 3 4	Opportunities for management positions.[453]
0 1 2 3 4	Material control.[454]
0 1 2 3 4	Material flow.[455]
0 1 2 3 4	Cost accounting.[456]
0 1 2 3 4	Production control.[457]
0 1 2 3 4	Production flow.[458]

RESPONSE KEY

0–None; not covered in this class
1–Mentioned; brief coverage, less than average
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Extent of Coverage **Instructional Topic**

0 1 2 3 4 Personnel.[458]
0 1 2 3 4 Quality control.[459]
0 1 2 3 4 Sales.[460]
0 1 2 3 4 Distribution.[461]
0 1 2 3 4 Printing cost estimating.[462]
0 1 2 3 4 Others.[463] ______________________________

(circle one) LAWS
0 1 2 3 4 Legal restrictions in printing.[464]
0 1 2 3 4 Copyright laws.[465]
0 1 2 3 4 Counterfeit laws.[466]
0 1 2 3 4 Laws concerning pornography.[467]
0 1 2 3 4 Laws concerning libel.[468]
0 1 2 3 4 Moral and ethical considerations of a printer.[469]
0 1 2 3 4 Others.[470] ______________________________

Thank you for your assistance in completing this information form. Please make any further comments or suggestions you may have at the bottom of this sheet.

MISSOURI
INDUSTRIAL AND EDUCATIONAL
GRAPHIC ARTS SURVEY

CENTRAL MISSOURI STATE UNIVERSITY

CHARLES E. KESEMAN, PROJECT DIRECTOR

GRAPHICS DEPARTMENT
WARRENSBURG, MO 64093
(816) 429-4450

September 2, 1975

Dear Sir:

Recently you were mailed an information form as part of the Missouri Industrial and Educational Graphic Arts Survey. As of this date we have not received your response.

Since a recommended curriculum for graphic arts in the secondary schools of Missouri will be based upon the findings of this study, it has tremendous potential for affecting the future of young men and women across the state and for providing well-prepared individuals for the graphic arts industries. Because of this potential we hope to include in the study a response from each of the commercial and in-plant printing firms in the state to identify the present activities and future needs.

Officers of such professional organizations as Printing Industries of America and In-Plant Printing Management Association from this state have endorsed this study indicating that it is long overdue and has considerable potential for the advancement of graphic arts within our state.

While you have this letter at hand, won't you complete the information form and return it to us. As we assured in the cover letter of the information form, your response will remain confidential and no firm will be identified in the final report.

If you have not received the information form or have misplaced it, but are willing to respond, please call me at the toll-free number of the University--800-892-2439, Extension 4450.

Thank you for your assistance.

Sincerely yours,

Charles E Keseman

Charles E. Keseman
Project Director

CEK/sep

November 27, 1975

Dear Sir:

During the past several months a copy of this survey form and a follow-up letter have been mailed to your firm requesting your response to a number of questions related to graphic arts activities in your firm. Since we have received no response we are assuming you did not receive the form or the form was laid aside or misplaced; hence, we are sending this duplicate copy

We need responses from many more firms in order to provide a valid study of the graphic arts needs in Missouri. We know you have a very busy schedule; but won't you take a few minutes to complete this form while you have it at hand?

If your firm does no printing or related activities, would you please inform us by (1) noting the fact on the inside front cover near your company code number and (2) return only the cover to us. Simply refold the cover with your address to the inside and ours on the outside and tape closed. In order to record accurate data we need this response with your company code number even if you are not involved in graphic arts. If you have completed the form and returned it since this mailing was made, please accept our thanks for the valuable professional service you have rendered to both industry and education in Missouri and disregard this request.

Sincerely yours,

Charles E. Keseman

Charles E. Keseman
Project Director

APPENDIX E

Data Table

APPENDIX E: DISTRIBUTION OF SCHOOLS REPORTING SPECIFIC CHANGES IN THE GRAPHIC ARTS CURRICULUM DURING THE PREVIOUS TWO YEARS BY TYPE OF SCHOOL

Type of Change	Junior High (N=12)	Comp. Jr/Sr High (N=21)	Voc-Tech High (N=9)	Total (N=42)
Courses Added				
Offset Printing	1	0	0	1
Vocational Graphic Arts	0	1	0	1
Screen Printing	0	1	0	1
Photography	0	1	0	1
Graphic Arts II	0	1	0	1
Camera and Offset	0	0	1	1
Courses Deleted				
Graphic Arts I & II	0	1	0	1
Letterpress (semester course)	0	1	1	2
Content Change				
More offset, less letterpress	0	1	0	1
New Typesetting methods	0	0	1	1
Sign Lettering added	0	1	0	1
Screen or Block Printing added	2	2	0	4
Spirit duplicating added	2	0	0	2
Offset Printing added	0	1	0	1
Photo Composition and Process Color added, Hand Compos. Deleted	0	0	2	2
Separate offset and Screen Courses	0	1	0	1
Change from Year to Semester Course	0	1	0	1
Change from Lecture to Laboratory Approach	1	0	0	1
Add Graphic Arts to General Shop	0	1	1	2
Other Changes				
Add PICA Materials	0	0	1	1
Change from year to semester Course	0	2	0	2
Total Changes	6	16	7	29

MISSOURI INDUSTRIAL AND EDUCATIONAL GRAPHIC ARTS SURVEY

ABSTRACT

PURPOSE: To ascertain the current status and trends of the graphic arts industries and graphic arts education in Missouri as a basis for later development of a formal body of content related to graphic arts for the various levels of occupationally orientated industrial arts and vocational industrial-technical education in the secondary schools of Missouri.

METHOD OF RESEARCH: This study included a rather extensive review of research and statistical data related to the graphic arts, a status survey of the graphic arts industries of Missouri in 1975, and a status survey of the graphic arts offerings in the public secondary schools of Missouri during the 1974-75 school year.

For the survey of graphic arts education, 387 of the 683 public secondary schools in Missouri responded to a short initial survey form and 82 of these indicated some graphic arts instruction in the industrial education program. Seven additional non-responding schools were known to offer graphic arts; therefore, comprehensive long forms were mailed to 89 schools. Forty-two of the 64 responding schools actually offered graphic arts and provided the data for the major portion of this survey. Data were analyzed for the junior high, comprehensive junior-senior high, and vocational-technical high school subgroups.

The industrial survey instrument was mailed to 2020 graphic arts establishments in Missouri--1389 commercial establishments and 631 in-plant operations formed the subgroups. A total of 231 commercial and 131 in-plant firms responded and, of these, 141 commercial and 91 in-plant firms provided usable data included in the analysis.

CONCLUSIONS: Although graphic arts instruction continued to expand, in 1975 only a few secondary school students received graphic arts instruction in Missouri. A number of students received instruction around grade eight for a short period of exploratory instruction and then a few students received in-depth instruction around grade eleven or twelve. Only in vocational-technical schools does the instructional content related to graphic arts reflect the contemporary graphic arts industry.

The principal objective of the vocational programs was to provide job entry skill in a cluster of graphic arts occupations. Objectives of other programs were primarily to develop student interest in graphic arts and acquaint students with graphic arts careers.

Most graphic arts teachers lacked depth in pre-service and in-service preparation in graphic arts and they expressed a need for more courses, work experience, and/or workshops related to graphic arts.

Most instructors beyond the junior high school general industrial arts course had production graphic arts responsibilities and advocated inclusion of these activities as a part of graphic arts instruction.

Financial support of secondary school graphic arts instruction seemed to be distributed more in proportion to the depth of instruction rather than the breadth of instruction.

Missouri had considerable graphic arts activity within in-plant facilities; however, the real extent of the total graphic arts activity was difficult to estimate.

Most graphic arts firms were rather general in the types of graphic arts activities they accomplished. Commercial printers expected increases in general commercial printing; in-plant firms expected greatest increases in business forms, general office duplicating, and fast copy centers.

Most printing firms used more than one image transfer method; however, lithography was the principal method of image transfer. Most firms expected greater increases in the use of lithography and in-plant firms expected increased use of xerography.

Graphic arts firms were small in size--two-thirds employed fewer than ten workers.

Vocational schools were not a strong source of graphic arts employees and were not the educational level most desired for most new employees.

Operations most used in Missouri related to the various aspects of planographic image transfer along with those in finishing and binding. Most firms performed all operations from idea to the finished product.

The abilities desired of vocational graphic arts graduates varied with the production area in which the worker was to be employed. Personal characteristics were often specified along with desired skills and knowledge.